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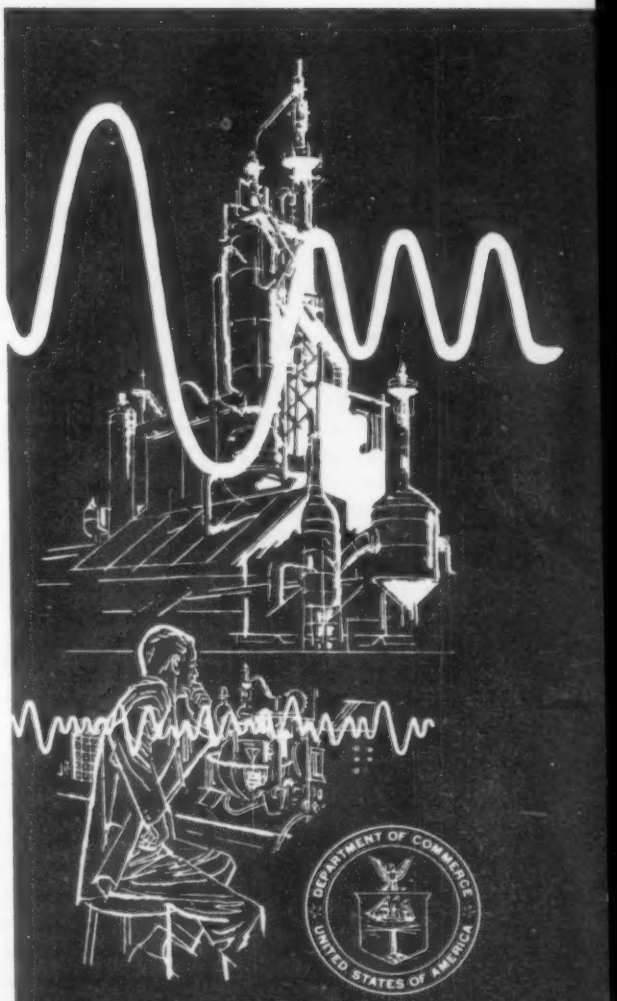


U. S. DEPARTMENT OF COMMERCE
BUSINESS AND DEFENSE SERVICES ADMINISTRATION
Office of Technical Services

**U.S. GOVERNMENT RESEARCH REPORTS**

**U.S. DEPARTMENT OF COMMERCE**
**Luther H. Hodges, *Secretary***

BUSINESS AND DEFENSE SERVICES ADMINISTRATION
Thomas E. Drumm, Jr., *Administrator*

**Office of Technical Services**
**John C. Green, *Director***

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# TECHNICAL ABSTRACT BULLETIN

## 1. AIRCRAFT AND FLIGHT EQUIPMENT

AD-259 079 Div. 1
(6 July 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
HOVERING FLIGHT INVESTIGATION OF TWO METHODS OF CONTROLLING A MAN-CARRYING DUCTED-FAN VEHICLE OF THE FLYING-PLATFORM TYPE,
by Lysle P. Parlett. June 61, 10p. incl. illus.
(NASA Technical note D-841)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-841.

DESCRIPTORS: *Flying platforms, Ground effect, *Control systems, Flight testing, Effectiveness, Flight, Tests, Control sticks.

Tests were performed during which men of widely varying previous flight experience served as pilots of a 4-ft-diameter vehicle, controlling it either kinesthetically or by a system of air jets actuated by an airplane-type control stick. All the men could control the vehicle satisfactorily with either system although some practice time was occasionally required by some men for one system or the other. Flights were generally smoother with the stick control system, which was preferred over the kinesthetic method by most of the men. (Author)

AD-259 151 Div. 1, 22
(7 July 61) OTS price $10.10

Vertol Div., Boeing Airplane Co., Morton, Pa.
STUDY OF THE BREATHING EFFECT ON THE H-21 HELICOPTER,
by William B. Peck, William S. Nutley and others.
1961, 1v. incl. illus. tables (Rept. no. R-243)
(Contract DA 36-034-ORD-3370, Proj. TN2-8057)
Unclassified report

DESCRIPTORS: *Helicopters, *Recoilless rifles, Mounting brackets, *Airframes, *Blast, Stresses, Mathematical analysis, Dynamics, *Helicopter rotors, Shock, Deflection, Tests, Test methods, Reinforcing materials, Gust loads, *Gun mounts, Helicopter blades.

An investigation was made of blast effects of a recoilless rifle fired from positions immediately beneath the H-21 helicopter to determine the feasibility of in-flight firing of the XM-29 weapon. The 3 sections of the study are identified as follows: (1) airframe static stress analysis, (2) airframe dynamic analysis, and (3) rotor system investigation. Static stress analysis techniques were applied by isolating the critical instant of the dynamic blast loading time history and calculating the associated internal stress in fuselage frames. The most efficient reinforcements were found to be aluminum alloy angles and plate gussets riveted to existing structure (six fuselage frames) at an estimated weight cost of 10 lb per aircraft. Dynamic analysis methods were also applied to the fuselage frame. A quantitative appraisal was made of the capabilities of both the H21 wood rotor blade and metal blade in withstanding crushing action of the blast pressure. It is considered on the basis of this comparison that the wood blade is marginal and the metal blade probably adequate for withstanding the blast pressure. (Author)

AD-259 170 Div. 1, 19
(11 July 61) OTS price $11.00

Bell Aerosystems Co., Buffalo, N. Y.
AIRCRAFT LANDING SYSTEM COMPATIBILITY STUDY. C-131A, AN/GSN-5.
Final engineering rept.
May 61, 136p. incl. illus. (Rept. no. 60003-039)
(Contract AF 33(616)6483)
Unclassified report

DESCRIPTORS: *Transport planes, Electronic equipment, *Automatic pilots, *Instrument landings, Instrument flight, All weather aviation, Flight testing, *Radar navigation, Navigation, Errors, Stability, Safety devices, Airplane engines, Control systems, *Airplane landings, Landing, Ground controlled approach radar.

The Landing Control, Central, AN/GSN-5 is a ground-based, final approach navigation system providing 3 basic approach and landing techniques, namely, completely automatic control, cross-pointer guided approach, and talkdown. These techniques may be used singularly or in combination. In all cases, however, aircraft surveillance and guidance information are maintained to touchdown. The study of the compatibility of the C-131A aircraft, the E-4 auto-pilot, and the Landing Control, Central, AN/GSN-5 indicates that, with the airborne and ground units conforming to the performance requirements stated herein, the aircraft and the AN/GSN-5 system are compatible, and that satisfactory all weather automatic final approaches and landings can be made. The aircraft is also compatible with the AN/GSN-5 system for cross-pointer or talkdown-guided approaches. (Author)

AD-259 237 Div. 1
(11 July 61) OTS price $8.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
GERMAN AERONAUTICS (SELECTED ARTICLES).
27 Jan 61, 80p. incl. illus. (Trans. no. MCL-284 of Deutsche Flugtechnik 3:65-96, Mar 59)
Unclassified report

DESCRIPTORS: *Aeronautics, Civil aviation, Aircraft, Design, Physical properties, Germany, Manufacturing methods, Measurement, Airframes, Construction, Propeller blades,

Flight testing, Adjustable pitch propellers, Monocoques, Variable pitch propellers, Gliders, Welding, *Aircraft industry.

Contents:
ICAO (International Civil Aviation Organization) and the IATA (International Air Transport Association), by Karl-Heinz Winker
The integral type of construction and its significance in the construction of aircraft, by Franz Strobel
New measuring methods for determining the elastic properties of materials, by Marianne Weidner
General and special information on landing gear drop tests - Part II, by Friedrich Seidel
Development and manufacturing problems dealing with propellers - Part III, by Max Lorenzen
White wings over Syria's brown earth, by Kurt Goetze
Welding in aircraft construction - Part IV, by Edward Kaluza

AD-259 252 Div. 1, 12
(11 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
DAMPING OF ACCELEROMETERS WITH A HIGHER NATURAL FREQUENCY,
by A. I. Mironov and M. I. Subbotin. 24 Apr 61, 3p. incl. illus. (Trans. no. MCL-876 of Izvestiya Akademii Nauk SSSR, Otkeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye 4:p. 132, 1960)
Unclassified report

DESCRIPTORS: *Accelerometers, Design, Tests, USSR, Technological intelligence, Damping, Oscillation.

Damped accelerometers with a natural frequency of up to 500 are described wherein the liquids of a comparatively low viscosity (up to 30 stokes) are used for damping. These accelerometers have a ''flat'' design. Apart from an increase of resistance forces, their merit consists also in a small variation of the natural frequency on filling up the instrument with liquid. (Author)

AD-259 313 Div. 1
(11 July 61) OTS price $1.10

Marine Corps Equipment Board, Quantico, Va.
MODEL GA-468 SINGLE-PLACE INFLATOPLANE.
Summary rept.
14 June 61, 4p. illus.
(Proj. 52-59-02)
Unclassified report

DESCRIPTORS: *Reconnaissance planes, Aircraft, Pneumatic devices, Tests, Effectiveness.

AD-259 384 Div. 1, 30, 9
(10 July 61) OTS price $5.60

Wichita U. School of Engineering, Kans.
GROUND EFFECT MACHINE INVESTIGATIONS AT THE UNIVERSITY OF WICHITA: FINAL REPORT SUMMARIZING THE TEST PROGRAM AND DATA OBTAINED,
by Claude A. Foltz. May 61, 50p. incl. illus. table (Engineering rept. no. 352-6)
(Contract Nonr-20103)
Unclassified report

DESCRIPTORS: *Ground effect, Model tests, Wind tunnels, Tests, Lift, Drag, Pitch, Test equipment, Aircraft, Nozzels, *Jets, Wind tunnel models.

Tests were performed on a family of circular, annular jet ground effect machine models. The testing, conducted in a low speed wind tunnel, investigated such parameters as slot width, convergence angle of the annular jet, model height above the ground, and model angle of attack using operating pressure ratio and forward velocity as test variables. Values of lift, drag, and pitching moment were recorded along with pressure measurements on the model outer surface, base plate, and ground board. Total and static pressures were also measured at 3 locations in the annular nozzle. (Author)

AD-259 391 Div. 1
(11 July 61) OTS price $5.60

Flight Dynamics Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
STRUCTURAL FLIGHT LOADS DATA FROM JET-TANKER OPERATIONS,
by Elmer M. Perry and John F. Rievley. Jan 61, 50p. incl. illus. tables.
(Proj. 1367; In cooperation with Dayton Research Inst., Ohio, Contract AF 33(616)6719)
(WADD TN 61-39) Unclassified report

DESCRIPTORS: *Transport planes, *Airframes, *Jet planes, Flight testing, Refueling in flight, Gust loads, Maneuverability, Load distribution, Stresses, Deformation, Tables.

Structural flight loads data from Strategic Air Command KC-135A aircraft performing normal aerial refueling missions and aerial refueling training flights are presented. The information gathered from this program will be used to verify or refine the load spectrum and should result in improved structural design criteria for future weapon systems. (Author)

AD-259 592 Div. 1
(14 July 61) OTS price $6.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
YEARBOOK OF THE GERMAN AVIATION RESEARCH (SELECTED ARTICLES).
7 Apr 61, 60p. (Trans. no. MCL-826 of Jahrbuck der Deutschan Luftahrtforschung, pp. 6-13, 37-50, 1959)
Unclassified report

DESCRIPTORS: *Germany, Scientific research, Research program administration, *Aeronautics, Mathematical analysis, Aircraft, Economics, Design, *Commercial planes, Landing gears, Civil aviation, Dynamics.

Contents:
The economy of air commerce as a basic requirement in the design of commercial aircraft, by George Backhaus
Influence of the swing slope on the dynamic behavior of the swinging landing gear, by Heinrich Kornmueller

AD-259 597 Div. 1
(14 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CIVIL AVIATION (SELECTED ARTICLES).
3 May 61, 5p. incl. illus. (Trans. no. MCL-605 of Grazhdanska Aviatsiya, pp. 16, 18, Sep 59)
Unclassified report

DESCRIPTORS: *Civil aviation, Aeronautics, Aircraft, USSR, *Aircraft seats, *Airplanes, *Commercial planes.

Contents:
The An-14 Honeybee aircraft
Thirty-two seats modification of the Il-14 and Il-12 aircraft

AD-259 619 Div. 1, 32
(17 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE ROLE OF PLANE-FAMILIES IN THE DESIGN OF AIRPLANES,
by Sz. J. 26 June 61, 5p. incl. illus. (Trans. no. MCL-934 of Repules, pp. 15, 3 Mar 61)
Unclassified report

DESCRIPTORS: *Airplanes, Design, Industry, Agriculture, USSR, *Aircraft industry.

AD-259 623 Div. 1, 33
(17 July 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
PASSENGER AIRCRAFT Il-18.
16 May 61, 17p. incl. illus. tables (Trans. no. MCL-923 of Izdatel'stvo Znaniye, Series 4, no. 35-36, pp. 5-17, 1960)
Unclassified report

DESCRIPTORS: *Transport planes, Design, USSR, Technological intelligence, *Commercial planes, *Air transportation.

The aircraft Il is a low-wing monoplane with 4 turboprop engines, tapering wings, a cylindrical fuselage of the diameter of 3.5 m consisting principally of a pressurized cabin, and a 3-strut landing gear. The nose part is taken up by the cabin of the crew and has room for 2 pilots, radio operator, navigator, and a flight engineer. The Il-18 is designed for a flight distance in actual operation up to 5,600 km, with a cruising speed of 650 km/hr, at an elevation of 8 to 10 km. The load can be as much as 14 tons. Seventy-three to 111 passengers can be accommodated, depending on the installations of the passenger compartments. (Author)

AD-259 627 Div. 1
(17 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
WE PRESENT THE NEW CZECHOSLOVAKIAN HELICOPTER OF THE TYPE HC 3,
by Ligeti Gyorgy, 26 June 61, 5p. incl. illus. (Trans. no. MCL-935 of Repules, p. 17, 3 Mar 61)
Unclassified report

DESCRIPTORS: Technological intelligence, Czechoslovakia, *Helicopters, Transport planes, Training planes, Design.

The prototype of the helicopter HC 3 was built in Letnany, Czechoslovakia. The source of energy for the HC 3 is the Czechoslovakian made piston engine of the type M 108, which supplies 240 hp at the altitude of 1000 m. Other features are; diameter of the rotor -11.6 m length of the machine -13.4 m height -3.4 m, weight-900 kg payload -350 kg, maximum speed -160 km/hrs maximum elevation -3500 m and range -500 km. A few fields of practical application are use in agriculture, use in the construction and maintenance of power lines, and use in building construction for transport of hanging loads. (Author)

AD-259 629 Div. 1
(17 July 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE STOL DORNIER.
26 June 61, 16p. incl. illus. (Trans. no. MCL-927 of L'Air Revue: pp. 178-181, Apr 60)
Unclassified report

DESCRIPTORS: *Airplanes, Vertical take-off planes, *Short take-off planes, Technological intelligence, France, Germany, Research planes, Engine nacelles, Airplane protuberances, Liaison planes, *Transport planes, Reconnaissance planes, Aerial propellers.

A brief description is given of three recent Dornier-manufactured, high-wing monoplanes: DO-27, DO-28, and DO-29. The DO-27 is a single-engine, propeller-driven STOL aircraft. Seven different versions of this plane are in production, including a hydroplane with raft-like floats. The DO-28 is a twin-engine conversion of the DO-27 with the engine nacelles mounted on short wing stubs, which project out from either side of the fuselage. The DO-29 is another two-engine version of the DO-27 but with the nacelles mounted under the wing and driving three-bladed pusher propellers. The rear part of these nacelles can be rotated 90 degrees downward for STOL/VTOL use.

AD-259 646 Div. 1, 19
(17 July 61) OTS price $3.60

Cook Research Labs., Morton Grove, Ill.
ADVANCED TACTICAL LANDING SYSTEM STUDY.
Quarterly rept. no. 1, 2 Jan-2 Apr 61, on A Study to Investigate Tactical High Density Landing System Problems for the Purpose of Recommending an Advanced System which will Fulfill the Army's Requirements in 1965,
by E. C. Gregory. 2 Apr 61, 30p. incl. illus. (Contract DA 36-039-sc-87260)
Unclassified report

DESCRIPTORS: All weather aviation, *Air traffic control systems, *Airplane landings, Army operations, Navigation, Landing, Military aircraft, Reliability, Instrument landings, Guidance, Control.

A preliminary investigation concerning the operational requirements of post 1965 Army tactical aircraft for an advanced high density landing system is reported. An advanced landing system is tentatively defined and all-weather landing concepts are discussed. The initial work of a kinematic approach to a solution of the terminal area navigation problem is appended. (Author)

# Division 1- AIRCRAFT AND FLIGHT EQUIPMENT

AD-259 680 Div. 1
(17 July 61) OTS price $1.50

National Aeronautics and Space Administration, Washington, D. C.
ANALYSIS OF X-15 LANDING APPROACH AND FLARE CHARACTERISTICS DETERMINED FROM THE FIRST 30 FLIGHTS,
by Gene J. Matranga. July 61, 52p. incl. illus. tables, 15 refs. (Technical note no. D-1057)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1057.

DESCRIPTORS: *Rocket planes, *Research planes, Flight testing, Airplane landings, Drag, Lift, Stability, Control, Control systems, Parasite planes, Landing, Control surfaces.

The approach and flare maneuvers for the first 30 flights of the X-15 airplane and the various control problems encountered are discussed. Depending on configuration, the peak lift-drag ratios from flight varied from 3.5 to 4.5 as compared with a predicted range of from 3.0 to 4.2. By employing overhead, spiral-type patterns beginning at altitudes as high as 40,000 ft, the pilots were consistently able to touch down within about + or - 1,000 ft of a designated point. A typical flare was initiated at a comfortable altitude of about 800 ft and an indicated airspeed of approximately 300 knots, which allowed a margin of excess speed. The flap and gear were extended when the flare was essentially completed, and an average touchdown was accomplished at a speed of about 185 knots indicated airspeed, an angle of attack of about 7 degrees and a rate of descent of about 4 fps. In general, the approach and landing characteristics were predicted with good accuracy in extensive preflight simulations. F-104 airplanes which simulated the X-15 landing characteristics were particularly valuable for pilot training. (Author)

AD-259 726 Div. 1, 14, 2
(18 July 61) OTS price $2.60

Lightning and Transients Research Inst., Minneapolis, Minn.
AEROSPACE VEHICLE PROTECTION FROM ATMOSPHERIC ELECTRICAL HAZARDS.
Quarterly rept. no. 1, Jan-Mar 61.
Apr 61, 18p. incl. illus.
(Contract AF 33(616)7828)
(ASD TN 61-74) Unclassified report

DESCRIPTORS: *Airships, Aviation safety, *Airship envelopes, Protective coverings, *Lightning arrestors, *Atmospheric electricity, Lightning, Electrical conductance, Hazards, Electric insulating tapes, *Electric insulation, Materials, Tests.

Initial work was done on lightning protection of airships. High current artificial lightning discharge tests were carried out on four samples of lightning protection braid attachment systems. The braid was intended for use in providing an external protection conductor network on the outside of the airship to prevent lightning discharges from entering the interior. Tests of the four samples disclosed that in each case excessive temperatures and burns occurred which could damage the airship envelope. On the basis of the results the sections were modified with locally available materials and additional tests were run. The tests on the additional sections in which thick insulation was provided between the braid and the envelope showed that the thicker insulation was effective in preventing excessive temperature rise in the envelope material; however, the more effective systems were also excessively rigid for airship use. An additional section incorporating the results of both series of tests with good thermal insulation to prevent excessive temperatures in the envelope material and suitable flexibility is proposed for a final test. (Author)

AD-259 765 Div. 1, 19
(17 July 61) OTS price $7.60

Applied Psychology Corp., Arlington, Va.
ANALYSIS OF THE USEFULNESS OF CODED INFORMATION IN VISUAL COLLISION AVOIDANCE,
by Theodore H. Projector and John E. Robinson, Jr. Jan 61, 66p. incl. illus.
(Sponsored by Federal Aviation Agency)
Unclassified report

DESCRIPTORS: Analysis, *Coding, Vision, *Aviation accidents, *Aviation safety, *Navigational lights, Visual perception, *Lighting systems, Mathematical analysis, Visual thresholds, Interception, Interception probabilities.

Various kinds of coded information which might be used to prevent mid-air collisions in visual flight were investigated. Sector coding (azimuthal aspect) was the only type of coding hitherto used or proposed. Analysis suggests that such coding was of much less value as a means of avoiding mid-air collisions than was supposed. A non-coded technique which many pilots used is the fixity-of-bearing criterion. It does permit more exact distinction between collision threats and non-threats, but was applicable only when both aircraft were flying straight, constant-speed courses. The limits of decision time were impossible in some cases. When closing speeds are high and when required pick-up ranges are large its usefulness was limited. These limitations, together with the inherent imprecision of the technique, result in considerable uncertainty in the use of the fixity-of-bearing criterion. Only altitude coding appears to offer a likelihood of improving a pilot's ability to distinguish threats from non-threats. The particular advantages are discussed.

AD-259 816 Div. 1, 22
(19 July 61) OTS price $9.10

Frankford Arsenal, Philadelphia, Pa.
DEVELOPMENT OF CATAPULT, T13E2,
by A. J. Magar. Mar 61, 108p. incl. illus. tables (Rept. no. R-1560)
(WADD TR 60-762) Unclassified report

DESCRIPTORS: *Catapults, Cartridges, Explosive actuators, Position finding, Safety, Tests, Propelling charges, Electric igniters, Aviation accidents, Automatic, *Rescue beacons, Parachutes, *Aircraft equipment, Safety devices.

Development was undertaken on a series of catapult devices which would eject a crash-locator beacon from a distressed aircraft, either at the pilot's discretion or automatically upon crash impact. The T13E2 catapult, with the T127E2 cartridge, was the only unit in the series fully developed under this program. The first test

models tested were of an open-tube catapult design. Although generally performing satisfactorily, these models could not meet certain Air Force requirements; hence therefore the open-tube design was abandoned in favor of a closed-tube system. Use of the closed-tube design resulted in successful development of the end item, which was designated as catapult, T13E2 with cartridge, T127E2. (Author)

AD-259 818 Div. 1, 16, 14, 28
(19 July 61) OTS price $3.60

Applied Psychological Services, Villanova, Pa.
DETECTABILITY OF NAVAL AIRCRAFT BY VISUAL MEANS, MEASURES TO INCREASE OR REDUCE; DEVELOPMENT OF AIRCRAFT DETECTABILITY AND VISIBILITY: IV. DETECTABILITY OF STIMULI PAINTED WITH FLUORESCENT AND ORDINARY PAINTS WHEN VIEWED AGAINST CLEAR AND CLOUDY SKY BACKGROUNDS,
by Arthur I. Siegel. May 61, 30p. incl. illus. tables.
(Contract N156-38581)
(Rept. no. NAMC-ACEL-460) Unclassified report

DESCRIPTORS: Detection, Visibility, Colors, *Color vision, *Aircraft markings, *Aircraft finishes, *Paints, Applied psychology, Visual thresholds, Fluorescence, Naval aircraft.

The detectability of square chromatic targets and a white target when viewed against clear and cloudy sky backgrounds was investigated by Applied Psychological Services in collaboration with the Air Crew Equipment Laboratory in order to provide certain of the information required as a basis for formulating aircraft exterior coloration recommendations. The stimuli involved were painted white, fluorescent yellow-orange, fluorescent red-orange, ordinary orange, fluorescent red-orange with a white center stripe, and fluorescent red-orange with a blue center stripe. Although the generality of the emergent data may be limited from several points of view, the data suggested that the stimulus of fluorescent red-orange with a white center stripe possessed the best over-all detectability. (Author)

## 2. ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-259 083 Div. 2
(5 July 61) OTS price $1.10

Oregon State Coll., Corvallis.
RESEARCH ACTIVITIES.
Progress rept. no. 2, 1 Jan-31 Mar 61,
by June G. Pattullo. May 61, 6p. (Ref. no. 61-2)
(Contract Nonr-128602, Proj. NR 083-102)
Unclassified report

DESCRIPTORS: *Oceanography, *Oceanographical data, Hydrographic surveying, Sedimentation, Salinity, Minerals, Marine biology, Scientific research, Oregon, Pacific Ocean.

Contents:
Hydrographic survey of Oregon coastal waters
Coastal temperature and salinity data
Plankton inventories
Accessioning
Trawl collections
Coastal sediments of northern Oregon
Water masses off the Oregon coast
Seasonal heat storage in the Pacific Ocean

AD-259 108 Div. 2, 6
(5 July 61) OTS price $3.60

United Research, Inc., Cambridge, Mass.
TURBULENCE MEASUREMENTS AT HIGH ALTITUDES BY SECOND-DIFFERENCE INTERFEROMETRY.
Quarterly rept. no. 3, 1 Jan-31 Mar 61,
by Dwight W. Batteau and Newton S. Lichtblau, on An Experimental System. 31 Mar 61, 35p. incl. illus.
(Contract DA 36-039-sc-84963)
Unclassified report

DESCRIPTORS: Turbulence, Measurement, High altitude, *Atmosphere, Stratosphere, Radar targets, *Radar tracking, Radio interferometers, Digital computers, Phase detectors, Phase measurement.

Two methods are given for analyzing data obtained from the radar coordinate system. Method I gives a functional relation between a coordinate difference of the two targets and their separation, and is given for theoretical interest, and because it provides a convenient independent check on the information obtained from Method II. The second method gives a procedure for obtaining complete information from the data furnished by a single radar array. The system for processing the data from the output of the receivers, particularly the techniques for comparing the phase differences, are discussed in detail. A series of experiments, designed to check out the system performance are discussed. Modifications made to the radar receiving system are described (Author).

AD-259 119 Div. 2
(7 July 61) OTS price $2.60

Arctic Inst. of North America, Washington, D. C.
OCEANOGRAPHIC OBSERVATIONS ON FLETCHER'S ICE ISLAND (T-3) WINTER 1959-1960,
by Jiro Muguruma. Jan 61, 18p. incl. illus.
(Scientific rept. no. 10; Research paper no. 6)
(Contract AF 19(604)3073)
(AFCRL-224) Unclassified report

DESCRIPTORS: *Oceanographical data, Sea water, Ice Temperature, Vertical indicators, Distribution, Surface properties, Arctic regions, Oceanography.

AD-259 120 Div. 2, 1
(7 July 61) OTS price $4.60

Air Weather Service, Scott Air Force Base, Ill.
PERCENTILES OF AIR DENSITY AT STATION LEVEL,
by Adam Kochanski. May 61, 42p. incl. illus. tables (Technical rept. no. 153)
Unclassified report

DESCRIPTORS: *Aircraft, Take-off, Landing, *Atmosphere, Density, Determination, Test methods, Surface properties, Geography, Statistical analysis.

A method is given for estimating certain percentiles of density at station level for any discrete point over the Northern Hemisphere. The main operational problem that requires knowledge of density distributions concerns SAC bombers that are on 15-minute alert. Occurrences of runway-density lower than a certain critical value may prevent the take-off of heavily-loaded aircraft. The hovering of the helicopters may be impeded by low densities. A technique is described which reconstructs that part of the cumulative frequency curve of density which lies between the 5th and the 95th percentile. The

technique permits one to estimate six points of the curve. The accuracy of estimates varies. The method was devised to give very high accuracy for the 5th, 10th, and 20th percentiles, i.e., for low densities that are adverse to aircraft take-off. For higher-than-average densities (i.e., for the 80th, 90th, and 95th percentiles) the technique allows only for rough estimates. (Author)

AD-259 124 Div. 2, 30
(7 July 61) OTS price $2.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
MODEL SEISMOLOGY. A TOOL FOR STUDYING GROUND SHOCK PHENOMENA,
by H. James Dorman, James G. Moore, and Leonard Rolnick. Mar 61, 30p. incl. illus. table (BRL memo. rept. no. 1331)
(Proj. 503-04-002)
Unclassified report

DESCRIPTORS: Seismic waves, Simulation, *Underground explosions, Shock waves, Model tests, Propagation, Attenuation, Measurement, Test equipment, *Test facilities, Electronic circuits, Seismographs, Tests, Blast.

The investigation of the effects of underground explosions is complicated by the wide variety of materials in which the effects of such explosions are of interest. In an attempt to avoid the necessity of extensive field tests in a large number of earth materials some of the problems concerned with the propagation of explosion-generated seismic waves in solid media were investigated on a laboratory scale using the techniques of model seismology. Of interest were the velocity, amplitude and frequency of seismic waves in various media, since from these data the elastic constants of the medium and the attenuation occurring within the medium can be calculated. A two-dimensional model is described which provided the means to study, on a scale basis, the propagation of ground shock phenomena resulting from impulsive loading such as that arising from the detonation of explosives in the ground. (Author)

AD-259 130 Div. 2, 30
(27 June 61) OTS price $1.60

Wave Research Lab., U. of Calif., Berkeley.
RIGID VERTICAL THIN BARRIER,
by R. L. Wiegel. June 59, 16p. incl. illus.
(Series no. 140, Issue no. 1)
(Contract NBy-3139)
Unclassified report

DESCRIPTORS: *Breakwaters, *Water waves, *Wave transmission, *Ocean waves, Power, Water tunnels, Test facilities, Theory, Test equipment, Mathematical analysis.

A theory is presented for the transmission of waves past a rigid vertical thin barrier extending from above the water surface to some distance below the surface. This theory is based upon consideration of wave power transmission. Laboratory data are presented to show that this theory is useful from the engineering design standpoint, but that improvements are desirable. (Author)

AD-259 142 Div. 2
(7 July 61) OTS price $1.60

Oregon State Coll., Corvallis.
PHYSICAL OCEANOGRAPHIC DATA OFFSHORE FROM NEWPORT AND ASTORIA, OREGON FOR JUNE 1959 TO 1960,
by Bruce Wyatt and Norman F. Kujala. May 61, 17p. incl. table (Data rept. no. 5; Reference 61-3)
(Contract Nonr-128602, Proj. no. 083-102)
Unclassified report

DESCRIPTORS: *Oceanographical data, *Ocean currents, Hydrographic surveying, Sampling, Bathythermograph data, Oregon, Tables, Pacific Ocean.

A study was conducted to establish the current patterns and water mass characteristics existing along the Oregon coast. Surveys previously were concerned with monthly samples from a maximum depth of 100 ft and out to 25 mi offshore from Newport, Oregon. Since December 1959, the program was expanded to include monthly oceanographic stations at 10-mi intervals from 5 to 45 mi west of Astoria and Newport with samples from a maximum depth of 200 m. This analysis presents the oceanographic data in graphic and tabular form, and a preliminary interpretation of the results is given. (Author)

AD-259 149 Div. 2
(7 July 61) OTS price $6.60

Texas A. and M. Research Foundation, College Station.
A NUMERICAL EXPERIMENT ON MESOSCALE MOIST CONVECTION,
by Rex L. Inman and Tom E. Sanford. Dec 60, 63p. incl. tables (Scientific rept. no. 2; Reference no. 60-24T)
(Contract AF 19(604)6136)
(AFCRL-617)
Unclassified report

DESCRIPTORS: *Convection, Storms, Moisture, Humidity, Meteorological data, Numerical methods and procedures, Experimental data.

Hinklemann's non-geostrophic multilayered model is modified to include the process of condensation and is applied to the problem of mesoscale convection. The atmosphere is assumed to be uniform along one horizontal coordinate. IBM 704 electronic computer computations were made starting with the same initial wind and temperature fields. In the case where moist air is considered, the initial conditions were chosen to represent two features of the temperature and moisture patterns observed on 11 June 1956 when an instability line developed near a dew-point in western Nebraska. A factor important in determining the location most favorable to the formation of an instability line in a situation where a dew-point front is observed is discussed. It is clear that gravitational instability which is important in the formation of instability lines can be caused by the latent heat supplied during the condensation process. It is concluded that the role of the dew-point front in the formation of an instability line is only to limit the region where this gravitational instability may develop. In some cases the dew-point front may define the western edge of a mesoscale convection system while in other cases where the air immediately to the east of the dew-point front is less humid the convective system may form farther to the east in a region where moisture is present. (Author)

AD-259 154 Div. 2
(7 July 61) OTS price $6.60

Minnesota U., Minneapolis.
THE TIME VARIATIONS OF SOLAR COSMIC RAYS DURING JULY 1959 AT MINNEAPOLIS.
by J. R. Winckler, P. D. Bhavsar, and L. Peterson. Oct 60, 59p. incl. illus. tables, 17 refs. (Technical rept. no. CR-31)
(Contract Nonr-71019)
Unclassified report

DESCRIPTORS: *Solar disturbances, *Cosmic rays, *Time, *Terrestrial magnetism, Magnetic storms, *Minnesota, Solar flares, Arctic regions, Ionization chambers, Geiger counters, Scintillation counters.

The cosmic ray particles followed directly the appearance of three large solar flares occurring on July 10 at 0210 UT, on July 14 at 0325 UT, and on July 16 at 2114 UT. At Minneapolis the cosmic ray events were well separated. Each flare was followed, in from one to two days, by a strong geomagnetic disturbance during which the main intensity of the cosmic rays appeared. The solar cosmic ray intensity at Minneapolis dropped to zero at the termination of each period of geomagnetic activity, and cosmic ray levels remained at the galactic background until the next event began. However, precursor effects and many other fluctuations were observed during the storms. The time variations observed at Minneapolis are not characteristic of the polar cap time variations. In the polar regions prompt effects were noticed at the time of the flares and also continuous large intensities which decayed slowly for many days and were unrelated to geomagnetic activity. (Author)

AD-259 287 Div. 2, 6
(11 July 61) OTS price $3.60

Florence U. (Italy).
METEOR DATA BULLETIN NO. 1.
Apr 60, 1v. incl. illus. tables.
(Contracts AF 61(052)44 and AF 61(052)227)
(AFCRL-114)
Unclassified report

DESCRIPTORS: *Meteors, *Meteorological radar, *Radar signals, Diurnal variations, Radar antennas, Azimuth, *Italy, Time, Tables, Radio astronomy, Statistical distributions.

Contents (Meteor radar data obtained at the Centro Microonde in April 1960):
Hourly rate
Distribution of duration
Duty cycle
Variations during the hours of the day
Distance distribution
Distribution as a function of the azimuth
Panoramic representations
Drifting echoes
Meteor tables

AD-259 288 Div. 2, 6
(11 July 61) OTS price $8.60

Florence U. (Italy).
METEOR DATA BULLETIN NO. 2.
May 60, 1v. incl. illus. tables.
(Contracts AF 61(052)44 and AF 61(052)227)
(AFCRL-115)
Unclassified report

DESCRIPTORS: *Meteors, *Meteorological radar, *Radar signals, *Italy, Diurnal variations, Radar antennas, Azimuth, Time, Tables, Radio astronomy.

AD-259 289 Div. 2, 6
(11 July 61) OTS price $1.60

Florence U. (Italy).
OBSERVATIONS ON THE QUADRANTID SHOWER,
by P. Francesco Checcacci and Mario Schaffner. Mar 60, 18p. incl. illus. tables (Technical note no. 5)
(Contract AF 61(052)227)
(AFCRL-116)
Unclassified report

DESCRIPTORS: *Meteors, Detection, Radar tracking, *Radar echo areas, Tables, Photographic recording systems, Classification, Photographic intelligence, Photographic analysis.

During the passage of a shower of Quadrantids, Radar was used with a photographic recording system. At the same time the echoes were observed on an oscilloscope. Observations were made from 30 December 1959 to 8 January 1960. A high percentage of the total number of echoes was received on January 3 and 4. Among the signals received during these two days, those which can be interpreted as echoes from meteor trails are shown in a panoramic form. The distance is plotted versus the time, a given echo is represented by a segment, the length of which indicates its duration, according to the following convention: a point corresponds to durations smaller than 0.2 sec; length 1 mm to durations comprised between 0.2 and 1 sec; 2 mm to durations comprised between 1 and 5 sec; 3 mm to durations comprised between 5 and 10 sec; 4 mm to durations larger than 10 sec. The numerical data of these echoes appear in tabular form. (Author)

AD-259 290 Div. 2
(11 July 61) OTS price $3.60

Florence U. (Italy).
ON THE DENSITY OF BRIGHT METEORS,
by Franco Verniani. Aug 60, 34p. incl. illus. tables (Technical note no. 6)
(Contract AF 61(052)227)
(AFCRL-117)
Unclassified report

DESCRIPTORS: *Meteors, Brightness, Density, Measurement, Ablation, Photographic intelligence, Tables, Mathematical analysis, Italy, Classification, Photographic analysis.

The meteoric density was calculated by using ablation's theory in connection with 135 Whipple's photographic data (almost all concerning fireballs). Remarkable differences are found between sporadic and shower meteors and between different showers, so that it is probable that meteors differ considerably one from another also by origin, shape and composition. Almost the half of sporadic meteors results compact stone with a density Rho 3.38 g/cc; out of the others, the 35% is constituted by porous bodies according to Whipple's icy comet model (average density Rho 0.67 g/cc) and the 21% by dustballs with Rho 0.15 g/cc. Taurids, Perseids and Lyrids appear composed in a large part by light stone meteors (Rho 1.1 divided by 1.4 g/cc); conversely Geminids show a very strong percentage of iron compact bodies. On the contrary, K-Cygnids are all dustballs with a very low density (Rho 0.05 divided by 0.08 g/cc). No dependence of the density on visual magnitude or mass was found in the magnitude range of the sample. An analogous calculation concerning faint photographic or visual meteors and, above all, radiometeors is clearly needed. (Author)

AD-259 291 Div. 2, 6
(11 July 61) OTS price $5.60

Florence U. (Italy).
RESEARCH ON METEOR BURST PROPAGATION.
Final rept.
Sep 60, 1v. incl. illus. tables.
(Contract AF 61(052)227)
(AFCRL-118) Unclassified report

DESCRIPTORS: *Meteors, Dectection, *Radar tracking, Radar pulses, Radar echo areas, Velocity, Deceleration, Ablation, Signal to noise ratio, *Radar equipment.

Contents:
Improvements of meteorological radar
Studies on increasing the pulse power by a signal synthesis method
Studies on the system for signal noise ratio improvements
The radar for meteor velocity measurements
The meteor data elaboration
Theoretical studies on velocity and deceleration of meteors
Volume density of radio echoes from meteor trails
Theory of meteor ablation
The computation of meteor density

AD-259 323 Div. 2
(11 July 61) OTS price $1.60

Marine Corps Equipment Board, Quantico, Va.
AN/PMQ-5 PORTABLE AEROLOGICAL SET, SERVICE TEST OF.
Final rept.
14 June 61, 12p. incl. illus. (Proj. no. 70-59-08)
Unclassified report

DESCRIPTORS: Instrumentation, Altimeters, *Meteorological instruments, Hygrometers, Tests, Wind direction indicators, Analysis, Humidity.

A service test of the AN/PMQ-5 Portable Aerological Set was conducted to determine its suitability for obtaining aerological data used in connection with computing helicopter lifts and conducting fixed wing air-base operations in an expeditionary environment. When modified as indicated in the test report, the AN/PMQ-5 is suitable for use as expeditionary equipment for a Marine Air Base Squadron aerology section. (Author)

AD-259 334 Div. 2
(10 July 61) OTS price $13.00

Marine Lab., U. of Miami, Coral Gables, Fla.
A REPORT OF DATA OBTAINED IN FLORIDA STRAITS AND OFF THE WEST COAST OF FLORIDA, JANUARY-JUNE 1960.
May 61, 189p. incl. illus. (Rept. no. ML-61126)
(Contract Nonr-84001)
Unclassified report

DESCRIPTORS: *Ocean currents, *Florida, *Florida straits, *Gulf of Mexico, *Sea water, Oceanographical data, Oceanography, Bathythermograph data, Bathythermographs, Oxygen, Temperature, Wind, Phosphates, Phosphorus, Inorganic substances, Marine biology, Aquatic animals.

Data were obtained on eight cruises of R/V GERDA and one cruise of R/V PANDA. All the cruises were carried out in Florida Straits and the eastern part of the Gulf of Mexico during the first half of 1960. The general purpose of the cruises was to provide (a) data for the study of the kinematics of the water movements in Florida Straits and adjacent waters, with particular attention to seasonal variations; and (b) environmental information for biological studies. Observations of currents made with drogues on Cruises G 6001, 6004, 6010, 6012, and P 6002 are not included, since they will be the subject of an analytical study to be submitted later. (Author)

AD-259 392 Div. 2, 6
(11 July 61) OTS price $2.60

Woods Hole Oceanographic Institution, Mass.
OCEANOGRAPHIC AND UNDERWATER ACOUSTICS RESEARCH.
Status rept., 1 Nov 60-30 Apr 61,
May 61, 25p. incl. illus. (Ref. no. 61-16)
(Contracts Nonr-136700, Proj. NR261-102 and Nonr 212900, Proj. 261-104)
Unclassified report

DESCRIPTORS: *Oceanography, *Underwater sound transmission, Acoustics, Sound transmission, Oceanographical data, Underwater sound laboratories, Ocean currents, *Atlantic Ocean, Bathythermographs, Echo ranging, Ocean bottom, Mapping, Underwater photography, Data processing systems.

Investigations were continued in a broad program of research in physical oceanography, submarine geophysics (including underwater sound), and submarine geology. Dr. Voorhise, using the temperature and pitotmeter current-shear measurements from the thermistor chain, found an equatorial counter-current in the Atlantic similar to the Cromwell current of the Pacific. Miss Bunce, Mr. Parker, and others in an intensive bathymetric survey found the channel (minimum depth cir. 2000 fms.) through the Mid-Atlantic Ridge by which cold water passes from the western Atlantic basin into the eastern Atlantic, and Miss Bunce, and Mr. Crampin successful measured the thickness of the continental crust, 23 km to a layer having a seismic velocity of about 7.6 km/sec, under the continental shelf south of Ireland. Analysis of acoustical, geophysical, geological, and bioacoustical data proceeded as rapidly as possible in competition with the sea-going program. (Author)

AD-259 437 Div. 2
(17 July 61) OTS price $3.60

Weather Forecasting Research Center, U. of Chicago, Ill.
A CONTRIBUTION TO THE CLIMATOLOGY OF THE ARCTIC STRATOSPHERE.
by E. Paul McClain. Feb 61, 32p. incl. illus. tables, 27 refs. (Scientific rept. no. 3)
(Contract AF 19(604)7230)
(AFCRL-612) Unclassified report

DESCRIPTORS: *Stratosphere, Arctic regions, Climatic factors, Meteorological data, temperature inversion, Statistical distributions, *Climate, *Weather forecasting, Statistical analysis, Temperature, Measurement.

A previous study of January temperatures in the mid-stratosphere at several arctic stations near 80W was extended to include other stations in the North American, European and Asiatic sectors of the Arctic and to the remaining 2 months of the winter season. Distinctly bimodal temperature frequency distributions are evidently confined to the general area of the Canadian Archipelago and northern Greenland, being characteristic of this region throughout the winter. Mean

25-mb charts and mean cross-sections are used to illustrate the 2 quite dissimilar thermal and circulation regimes that tend to dominate the arctic stratosphere for long periods during the polar night. (Author)

AD-259 439 Div. 2
(11 July 61) OTS price $.75

Brookhaven National Lab., Upton, N. Y.
A STUDY OF THE WIND PROFILE IN THE LOWEST 400 FEET OF THE ATMOSPHERE.
Progress rept. no. 8, 16 Sep 60-15 Jan 61,
by Irving A. Singer and Constance M. Nagle.
15 Jan 61, 28p. incl. illus. tables (Rept. no. BNL 652 (T-210))
(Proj. 3A99-07-001-03)
Unclassified report

DESCRIPTORS: *Wind, Measurement, Test methods, Errors, Analysis, Diurnal variations, Velocity, Atmosphere models, *Micrometeorology, Turbulence, *Atmosphere, *Weather forecasting.

Efforts were continued on the analysis of errors in predicting upper level wind speeds from speeds at a lower reference level by using an unweighted predictor of varying averaging length and relative displacement in time. Analyses of hindcast predictions revealed that resultant errors were slightly smaller than those for forecast predictions. However, the results show that the errors were effectively symmetrical about zero. Hindcast analysis also revealed that during unstable conditions the prediction errors were smaller for short averaging lengths. During stable conditions, the forecast predictions were lower than hindcast predictions for all averaging lengths used in the test procedure. The relationship between errors with minus L and plus L displacements was approximately the same for both simple and mean models. The same symmetry was observed in the analysis of additional runs with similar gustiness characteristics. (Author)

AD-259 442 Div. 2
(14 July 61) OTS price $3.60

Brown U. Div. of Applied Mathematics, Providence, R. I.
ON THE RADIAL SPREADING OF BORES,
by M. C. Shen. May 61, 34p. incl. illus. (Technical rept. no. 41)
(Contract Nonr-56207, Proj. NR-062-179)
Unclassified report

DESCRIPTORS: *Water waves, Wave transmission, Underwater explosions, Seismic waves, Ocean waves, Partial differential equations, Integral equations.

This analysis concerns long waves spreading radially into water at rest. The water motion is assumed axially symmetrical, and the equilibrium depth is assumed uniform. As in (AD-243 769), the wave is considered known, and assumed of a type consistent with the shallow-water approximation, at some radius which is large compared with the depth. The investigation concerns the development of the wave, as it spreads into water at rest, and attention is confined to the head of the wave, close to its front, where the surface elevation is small compared with the water depth and the wave possesses a progressive character. The aim is to obtain a uniform first-order approximation with respect to this small parameter. (Author)

AD-259 462 Div. 2
(13 July 61) OTS price $2.60

Florida State U., Tallahassee.
VARIATIONS IN THE ANNUAL FREQUENCY OF TROPICAL CYCLONES, 1886-1958,
by C. L. Jordan and Te-Chun Ho. 15 June 61, 23p. incl. illus. tables.
Unclassified report

DESCRIPTORS: *Cyclones, Tropical regions, Frequency, Meteorological data, Climatic factors, Statistical analysis, *Weather forecasting, Periodical variations.

Climatological records show that the number of tropical cyclones originated in the individual formation areas varies appreciably from year to year. These fluctuations do not appear to be completely random and there are periods as long as ten years when the average activity in given areas may be significantly above or below the long term average. Although these fluctuations appear as rather prominent features on the longer records, attempts to establish recurrent patterns were not very rewarding. (Author)

AD-259 463 Div. 2
(24 July 61) OTS price $1.60

Geological Survey, Denver, Colo.
STUDY OF SEISMIC PROPAGATION PATHS AND REGIONAL TRAVELTIMES IN THE CALIFORNIA-NEVADA REGION.
Semiannual progress rept. 30 Dec 60-31 May 61,
by L. C. Pakiser, R. E. Warrick and others.
31 May 61, 20p. incl. illus.
(ARPA Order no. 193-61)
Unclassified report

DESCRIPTORS: *Seismic waves, *Seismographs, *Geophysics, California, Nevada, Gravity, Geology, Magnetic recording systems, Oscillographs, Geological survey.

The Crustal Studies Group investigated new seismic equipment for long-range seismic refraction profiling, shot-point to recorder communications, and timing. INSTRUMENTATION: The seismic refraction system features a reel-to-reel magnetic tape recorder and a photographic oscillograph for recording seismic waves. The 8 seismic-amplifier outputs are displayed on the oscillograph at 2 levels of amplification separated by 15 db. The communications system consists of 3 HF allocations in the 3- to 8-mc range, for radiotelephone and shot-instant signaling when propagation conditions are good, and LF (180 kc) for transmitting shot-time instants. SEISMIC FIELD OPERATIONS: The adaptability of the seismic refraction system was shown in recording long-offset shots. GRAVITY STUDIES: Studies are under way in the Southern Rocky Mountains, Colo., Sierra Valley, Calif., Snake River Plain, Idaho, and Yellowstone Plateau. THEORETICAL STUDIES: A digital computer is being used to calculate the frequency content of seismic waves. Studies were started into surface wave dispersion for Love and Rayleigh waves by using a digital computer program for calculating dispersion curves for reasonable models of crust mantle systems, where crust is defined as including all layers, from the surface down, lying above the layer having compressional wave velocity of about 8.1 km per sec.

# Division 2-ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-259 482 Div. 2
(19 July 61) OTS price $1.10

Indiana U., Bloomington.
PHOTOMETRY OF ASTEROIDS, THE MOON, PLANETS, AND REFLECTION NEBULAE,
Final rept. 1 Sep 58-30 June 61,
by Thomas Gehrels. 30 June 61, 4p.
(Contract Nonr-253600)

Unclassified report

DESCRIPTORS: *Artificial planetoids, *Planets, *Moon, Nebulae, *Photometers, Spectrophotometers, Design, Polarization, *Astronomy, Interstellar matter, Spectrographic analysis, Balloon gondolas, Telescopes.

A photometer is described which enables UBV-transfers, asteroid lightcurve photometry, polarimetry, and color photometry. The effective wavelengths for the polarimetry range between 3250 and 9900 Angstroms. Through the use of this instrument and powerful telescoped it was found that the polarization on most objects is strongly wavelength dependent. A steep increase toward the ultraviolet was found for lunar regions, for Mars, for Mercury, and for Venus. A maximum in the amount of plane polarization near the visual, with a sharp decrease toward longer and a slow decrease toward shorter wavelengths, was found for the interstellar polarization. A steep increase of the polarization toward the infrared was found on reflection nebulae. (Author)

AD-259 497 Div. 2, 1, 12
(14 July 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
HORIZON SENSOR PERFORMANCE IN MEASURING ALTITUDE ABOVE THE MOON,
by P. J. de Fries. July 61, 20p. incl. illus.
(Technical note no. D-609)

Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-609.

DESCRIPTORS: Moon, Lunar probes, Height finding, Horizontal indicators, Extraterrestrial geography, Space navigation, Altimeters, Optical instruments, Geodesics.

The diameter of the apparent lunar disc can be measured with a horizon sensor. This information may be used by a space vehicle approaching the moon to determine its altitude above the surface. If the lunar radius is not accurately known, an error will result. Also, errors in measuring the chord of the lunar sphere will be caused by the electronic gear and by the uneven features of the moon's surface. In addition, the subvehicle point may lie on an elevation or a depression referenced to the ideal sea level. An error analysis is necessary to determine the usefulness of altitude information obtained by a horizon sensor. (Author)

AD-259 576 Div. 2, 12
(14 July 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE ORBITS OF MOON ROCKETS,
by L. I. Sedov. 23 May 61, 15p. incl. illus. table (Trans. no. MCL-877 of Fizikai Szemle 10:241-245, 1960)

Unclassified report

DESCRIPTORS: *Moon, Guided missile trajectories, *Orbital flight paths, USSR, Technological intelligence, Launching, Earth, *Celestial mechanics, Ballistics, *Lunar probes.

AD-259 610 Div. 2, 25
(17 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
MAGNESIUM AND CALCIUM IONS IN THE EARTH'S UPPER ATMOSPHERE,
by V. G. Istomin. 26 May 61, 8p. incl. illus. table (Trans. no. MCL-1071 of Doklady Akademii Nauk SSSR 136:1066, 1961)

Unclassified report

DESCRIPTORS: *Ionosphere, Upper atmosphere, *Ions, Magnesium, Calcium, Atmospheric sounding, Sounding rockets, Mass spectrometers, *Alkaline earth metals, *Alkali metals, Detection.

The detection and measurement of the concentration of atoms (ions) of alkali and alkali-earth metals in the upper atmosphere by means of sounding rockets is discussed. (Author)

AD-259 631 Div. 2
(17 July 61) OTS price $2.60

Air Force Missile Development Center, Holloman Air Force Base, N. Mex.
GEOLOGICAL CONSIDERATIONS FOR PRECISION HIGH-SPEED ROCKET TRACKS,
by Kenneth R. Etter. June 61, 16p. incl. illus.
(Rept. no. AFMDC TR 61-21)
(Proj. 6876)

Unclassified report

DESCRIPTORS: *Test facilities, *Tracks (Aerodynamics), Rocket propelled sleds, *Inertial guidance, Gravity, *Geology, Earthquakes, California, New Mexico.

The relationship of orogenic (mountain building) forces to the high earthquake incidence in California is shown to be directly connected through the mechanism of strong movements on living faults, especially the San Andreas fault system. Air Force Flight Test Center (AFFTC) is nearly surrounded by wrench fault zones, the loci of potentially destructive quakes. Air Force Missile Development Center (AFMDC) is bordered by gravity faults of essentially quiescent nature, which fact, along with a geologic history of relative stability as part of the continental nucleus, leads to the conclusion that destructive events of a tectonic nature are much less likely to affect the facilities established in central New Mexico, than would be the case in southern California. (Author)

AD-259 636 Div. 2
(17 July 61) OTS price $1.60

Air Weather Service, Scott Air Force Base, Ill.
A PRELIMINARY INVESTIGATION OF A GEOSTROPHIC WIND APPROXIMATION FOR FORECASTING MAXIMUM SURFACE WIND,
by Myron K. Cox. May 61, 14p. incl. tables.

Unclassified report

DESCRIPTORS: *Weather forecasting, *Wind, Virginia, Gusts, Sea breeze, Mathematical prediction, Tests, Theory.

The geostrophic wind is discussed as an approximation to the maximum observed wind. A semi-objective technique is presented for forecasting the maximum obtainable wind using a station gradient network and curvature considerations. The forecast method herein described had an over-all verification probability of 0.91. (Author)

AD-259 637 Div. 2
(17 July 61) OTS price $1.60

Air Weather Service, Scott Air Force Base, Ill.
LOCAL FORECAST MANUAL, THULE AIR BASE, GREENLAND. RELIABILITY OF OBJECTIVE RULES FOR FORECASTING STRONG SURFACE WINDS. APPENDIX.
1961, 13p.
Unclassified report

DESCRIPTORS: *Weather forecasting, *Greenland, Wind, *Gusts, Meteorological data, Air force research, Handbooks, Test methods, Reliability.

Actual and potential storm situations from September 1959 to May 1960 and the same period 1960 to 1961 were studied. A total of 80 forecast situations occurred during the two seasons. This study was made to test the reliability of objective forecast rules as stated in the Local Forecast Manual. All data were available to the forecaster at least three hours prior to the onset of strong gusty winds at Thule AB. (Author)

AD-259 659 Div. 2, 25
(17 July 61) OTS price $4.60

Geophysical Inst., U. of Alaska, College.
A SPECTROPHOTOMETRIC STUDY OF THE AURORA OF 27 NOVEMBER 1959 AT COLLEGE, ALASKA,
by Charles S. Deehr. May 61, 42p. incl. illus. tables (Scientific rept. no. 10; UAG-R119)
(NSF Grant no. Y/22.6/327)
Unclassified report

DESCRIPTORS: *Aurorae, *Spectrographic analysis, Spectrophotometers, Night sky, Light, Intensity, Tables, Alaska.

Observations are described which represent the first extensive quantitative data on a relatively rare auroral phenomenon, a high latitude red arc. While normal auroras generally occur at about 100 km above the earth's surface, the red arc occurred at about 350 km. Detailed study of this arc may allow certain deductions to be made on the state of the atmosphere at a height level which is very difficult to study from the ground by other techniques. On November 27, 1959 at 1642 AST, the all-sky camera at Point Barrow, Alaska, recorded a faint auroral arc at 30 deg zenith distance to the geomagnetic north. At College, Alaska, a photometer which had just completed measurements of the enhancement of the sodium D lines in the twilight, detected the arc during an alumcantar sweep (in $\lambda$6300) at about 1645. The absolute intensities of $\lambda$6300, $\lambda$5577, and $\lambda$5893 obtained photometrically are given for the period during which the red arc was visible. Spectrograms and all-sky camera pictures of the red arc are discussed and a diagram of the associated disturbance magnetic field effects is given. (Author)

AD-259 704 Div. 2, 30
(17 July 61) OTS price $2.60

Texas A. and M. Coll., College Station.
IMPROVEMENT, EVALUATION, AND EXTENSION OF CAPABILITIES OF METEOROLOGICAL SIMULATION (DALLAS TOWER PROGRAM.
Quarterly rept. no. 3, 16 Dec 60-15 Mar 61,
by William H. Clayton, May 61, 19p. (Ref. no. 61-11T)
(Contract DA 36-039-sc-84942)
Unclassified report

DESCRIPTORS: Meteorology, *Weather forecasting, Weather stations, Instrumentation, *Meteorological instruments, Analog computers, Simulation, Texas, Research program administration.

This analysis reviews the concluding stages for the field installation of a mesoscale meteorological network to be employed for evaluation of objective forecasting techniques for the frictional boundary layer. (Author)

AD-259 706 Div. 2
(18 July 61) OTS price $6.60

Texas A. and M. Coll., College Station.
OCEANOGRAPHY AND METEOROLOGY OF THE GULF OF MEXICO.
Annual rept. (Final) 1 May 60-30 Apr 61,
by Hugh J. McLellan and Dale F. Leipper.
1 June 61, 65p. incl. illus.(Ref. no. 61-15F)
(Contract N7onr-48702, Proj. NR 083 036)
Unclassified report

DESCRIPTORS: *Oceanography, *Marine meteorology, Ocean currents, Sedimentation, Geology, Coral reefs, Recording devices, Instrumentation, Gulf of Mexico.

Contents:
Physical oceanography and marine meteorology
Investigations of the Yucatan current
Study of the equatorial current system
Internal waves
Feasibility of air-sea interaction research using automated systems
Gross air-sea interactions
Thermochemical properties of sea water
Marine geophysics
Seismic refraction
Gravity investigations at sea
Geology and geo-chemistry
Clay mineralogy of marine sediments and sedimentary processes
Carbonate sediments and environment of Campeche bank
The Campeche reefs
Distribution of foraminifera in the barrier reef and lagoon of British Honduras
The coral distribution and sediment constituents of Cayo Arenas
Instrumentation
Contouring temperature recorder

AD-259 732 Div. 2, 30
(18 July 61) OTS price $2.60

Naval Ordnance Test Station, China Lake, Calif.
HISTORY OF THE NOTS RESEARCH PROGRAM ON THE PHYSICS OF THE UPPER ATMOSPHERE,
by Edward V. Ashburn. 31 May 61, 22p. incl. illus. table, 82 refs. (Rept. no. NOTS TP 2689)
(NAVWEPS rept. no. 7733) Unclassified report

DESCRIPTORS: *Upper atmosphere, Scientific research, Physical properties, Conferences, History, Test facilities, Physics.

This research program may be conveniently divided into three phases. The first phase is associated with the U. S. Army Air Force--Navy program using three B-29 aircraft as flying laboratories. This program was initiated by the Naval Office of Research and Invention in the spring of 1946. In July 1946, the Office of Naval Research sponsored the program, and the Naval Ordnance Test Station acted principally as a service facility for the B-29's and the visiting scientists. The second phase of the research program was associated with the selection

of a site and the construction of the White Mountain Research Station. Two years after this high-altitude observatory was established, its control was transferred to the University of California. The third phase is associated with an active program of basic research in the physics of the upper atmosphere. (Author)

AD-259 735 Div. 2
(26 July 61) OTS price $3.60

Florida State U., Tallahassee.
THE STRATOSPHERIC WARMING OVER NORTH AMERICA IN 1957. II. HEIGHT, TEMPERATURE, VORTICITY, AND VERTICAL MOTION AT THE 50-MB SURFACE,
by Richard A. Craig, M. A. Lateef, and R. A. Mitchem. 1 July 61, 16p. illus. (Scientific rept. no. 2)
(Contract AF 19(604)5471)
(AFCRL-651) Unclassified report

DESCRIPTORS: *Stratosphere, *Temperature inversion, Meteorological charts, Vortices, Turbulence, Height finding, *North America, Meteorological data.

Three subdivisions are recognized for the period 16 Jan. to 16 Feb. (a) Until about 20-21 January, a single trough extended from the high latitude low and moved slowly from the United States over the Atlantic Ocean. This trough was warm in middle latitudes, the lapse rate in the trough was positive and there was descending motion west of the trough and ascending motion east of the trough. (b) From about 20-21 January until about 2 February, two troughs were usually in evidence, one extending into the southwestern United States, the other over Southern Greenland from the high-latitude low. The latter was not always defined at 50 mb and might possibly have been absent on some days. (c) During the period after about 2 February, the greatest changes took place. The high latitude low moved slowly westward and filled. The United States trough became a cold trough, particularly at 50 mb, and slowly retrogressed. A broad area of downward motion overspread nearly the entire United States and all of Canada except the northwestern part. The Atlantic warm center intensified, particularly at 50 mb, and moved generally northwestward. (Author)

AD-259 841 Div. 2
(17 July 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
SPORADIC-E AS OBSERVED WITH ROCKETS,
by J. Carl Seddon. July 61, 13p. incl. illus. table (Technical note no. D-1043)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note no. D-1043.

DESCRIPTORS: *Sounding rockets, *Ionosphere, Electrons, Density, New Mexico, Manitoba, Wind, Magnetic fields, Terrestrial magnetism, Ionization, *Atomospheric sounding.

Data obtained with rockets flown over New Mexico, U. S. A. and Manitoba, Canada have always shown the sporadic-E layer to be a thin layer with a large electron density gradient. The vertical electron density profiles and the horizontal uniformity of the sporadic-E layer are discussed herein. These layers have a strong tendency to form at preferential altitudes separated by approximately 6 km, and a striking correlation exists with windshears and magnetic field variations. In two cases where comparisons with ionograms were possible, the minimum frequency of the F-region echoes was found approximately equal to the plasma frequency of the sporadic-E layer reduced by half the gyrofrequency. On the other hand, the maximum frequency of the sporadic-E echoes as noted on ionograms was sometimes as much as 1 to 2 Mc greater than the plasma frequency. (Author)

AD-259 953 Div. 2
(24 July 61) OTS price $11.50

Air Force Cambridge Research Labs., Bedford, Mass.
PROCEEDINGS OF THE THIRD ANNUAL ARCTIC PLANNING SESSION, NOVEMBER 1960,
ed. by George P. Rigsby and Vivian C. Bushnell. Apr 61, 148p. incl. illus. table (GRD Research notes no. 55; AFCRL-436)
Unclassified report

DESCRIPTORS: *Ice Islands, Terrain, Physical properties, Ice, Meteorological data, Geological survey, Permafrost, *Geophysical prospecting, Aerial reconnaissance, Arctic regions, Conferences.

Results of field investigations and laboratory studies associated with the Arctic Terrain Research Program of the Terrestrial Sciences Laboratory are given. Reports include research accomplished in the Arctic Ocean, studies of ice-free land, studies of ice shelves and ice islands, investigations of Arctic Lakes and research into the engineering properties of ice. Also included is the complete record of a discussion by a panel of arctic experts on the problems of arctic research and the direction it should take. (Author)

AD-259 955 Div. 2, 30
(24 July 61) OTS price $3.60

Air Force Cambridge Research Labs., Bedford, Mass.
HORIZONTAL SOUNDING BALLOON FEASIBILITY STUDY,
by Thomas B. Spalding and Samuel B. Solot. May 61, 27p. incl. illus. tables, 13 refs.
(GRD Research notes no. 56; AFCRL-458)
(Proj. 7776)
Unclassified report

DESCRIPTORS: *Meteorological balloons, Meteorological instruments, Collecting methods, Tracking, *Atmospheric sounding, Instrumentation, Meteorological data, Wind, Test methods.

A study was made to determine the feasibility of using plastic balloons that float freely at constant-density altitude to provide a more comprehensive understanding of the atmospheric circulation in the Northern Hemisphere. The study indicates that development of an effective and economical means of gathering weather data over the Northern Hemisphere using such balloons is feasible. One area that requires considerable research and development is the concept of two-dimensional and distributed electronics. There are other areas in the total program that also require development, such as, the balloon vehicle itself, a tracking network, and associated balloon distribution network. It appears that all of these areas can be successfully developed prior to the development of two-dimensional balloon electronics. (Author)

AD-259 956 Div. 2
(24 July 61) OTS price $2.60

Air Force Cambridge Research Labs., Bedford, Mass.
INSTABILITY AND VERTICAL MOTIONS IN THE JET STREAM,
by Joachim P. Kuettner and George S. McLean.
May 61, 15p. incl. illus. (GRD Research notes no. 57; AFCRL-473)
(Proj. 8626)
Unclassified report

DESCRIPTORS: Meteorology, *Jet streams (Meteorology), Cirrus clouds, Velocity, Wind, Turbulence, Aircraft, Flight paths, Vertical gust recorders.

General characteristics of jet streams are described and cloud patterns in the vicinity of the jet core are discussed. Regions of dynamic instability in the cloudy areas and attendant vertical motions observed during Project Jet Stream flights indicate that bands of weak vertical motions (order of 1 m/sec) 50 to 100 km wide, parallel the jet-stream core on its right (southern) side over most of its length. These vertical motions would be sufficient to support a sailplane of very high performance. Caution must be exercised since severe turbulence can be expected in cyclonically curved jet streams just ahead of a trough line, where it intersects a zone of strong horizontal wind shear. (Author)

## 3. CHEMICAL WARFARE EQUIPMENT AND MATERIALS

AD-259 458 Div. 3, 26, 17
(13 July 61) OTS price $1.60

Container Labs., Inc., Washington, D. C.
THE SELECTION AND USE OF VOLATILE CORROSION INHIBITORS FOR THE PRESERVATION OF CHEMICAL CORPS EQUIPMENT AND MATERIEL.
Final rept.,
by Jackson B. Weaver. 21 June 61, 11p.
(Contract DA 18-108-cml-6424)
Unclassified report

DESCRIPTORS: *Corrosion inhibition, Metals, *Military equipment, *Chemical warfare, Corrosion research, Packaging, Preservation, Plastics, Coatings, Liquids, Solids.

Effort was made to investigate, evaluate, test, and establish firm criteria and operating directives for the use of commercially available VCI (volatile corrosion inhibitors, MIL-P-3420 and MIL-P-8574) in the preservation of Chemical Corps equipment and materiel. A synopsis is presented of a report on a literature survey and preliminary investigations submitted on 20 January 1958. On the basis of the survey and 37 tests evaluated, it was concluded that VCI are available as coatings on paper, Al foil, and Mylar, as well as in crystalline or liquid form so that special purpose solutions can be devised for almost any end use; a universally usable VCI is probably unattainable; the utility of VCI on purely ferrous parts was demonstrated; supplementary preservative oils and greases on ferrous parts are not required; VCI should not be considered as preservative compounds for nonferrous metals; VCI should not be used with certain equipment; VCI are essentially non-toxic. A tentative directive for the selection and use of VCI was submitted which listed 4 evaluation or compatibility tests, and a final directive was submitted.

AD-259 464 Div. 3, 28, 16
(17 July 61) OTS price $1.10

Hazleton Labs., Falls Church, Va.
(No title).
Progress rept. no. 13, 10 July 61.
10 July 61, 5p.
(Contract DA 18-108-405-cml-826)
Unclassified report

DESCRIPTORS: *Chemical warfare agents, Conditioned reflex, Exercise, Dosage, Tests, Pharmacology, Reaction (Psychology), Mammals, Primates, Visual perception, Physical properties, Toxicity.

## 4. CHEMISTRY

AD-259 091 Div. 4
(5 July 61) OTS price $8.10

Rensselaer Polytechnic Inst., Troy, N. Y.
THE OXIDATION OF SYM-DIETHYLDIBORANE.
Doctoral thesis,
by Erik I. Sandvik, Stephen E. Wiberley, and Walter H. Bauer. May 61, 95p. incl. illus. tables, 38 refs.
(Contract AF 49(638)897)
(AFOSR-710)
Unclassified report

DESCRIPTORS: *Diboranes, *Boron compounds, Hydrides, Ethyl radicals, Oxidation, Explosions, Temperature, Stability, Chemical reactions, Reaction kinetics, Synthesis, Gases.

The gas phase oxidation of sym-diethyldiborane (I) was studied under both explosive and non-explosive conditions. The non-explosive partial oxidation was studied from 40 to 80 C. Comparison of the relative rates of I consumption, O consumption and H formation indicates that 2 intermediate partial oxidation products are present. The rate of disappearance of I in the partial oxidation was zero order in O and first to three-halves order in I. The products of explosions with mixtures of O and I (9:1 ratio) were observed to be CO2, H2O and a white solid, presumably B2O3. A well defined explosion limit for the 9:1 mixtures in 6.8-cm bulbs coated with reaction products was observed. The effect of He and Ar on the explosion pressure clearly indicates that the mechanism causing explosion is primarily thermal. The over--all order of the reaction leading to explosion was in the region from first to three-halves order. (Author)

AD-259 093 Div. 4
(5 July 61) OTS price $8.60

Rensselaer Polytechnic Inst., Troy, N. Y.
THE OXIDATION OF TETRABORANE.
Doctoral thesis,
by Kenneth H. Ludlum, Stephen E. Wiberley, and Walter H. Bauer. June 61, 81p. incl. illus. tables, 40 refs.
(Contract AF 49(638)897)
(AFOSR-401)
Unclassified report

# Division 4-CHEMISTRY

DESCRIPTORS: *Boron compounds, Hydrides, Oxidation, Explosions, Chemical reactions, Reaction kinetics, Temperature, Stability, Synthesis, Physical properties, Molecular structure, Diboranes.

An investigation of the explosive oxidation of tetraborane and the partial oxidation of tetraborane was undertaken. Mixtures of tetraborane with O, and with O and inert gas were prepared at known pressures and temperatures in the reaction bulbs; these mixtures exploded on heating. The data obtained indicated a branching chain reaction with chain initiation in the gas phase and chain breaking on the wall of the vessel. The entire range of pressures and temperatures investigated shows the behavior generally attributed to the first explosion limit of a branching chain reaction. Lead tetraethyl was found to inhibit the reaction erratically and in some cases prevented explosion. The partial oxidation of tetraborane was brought about by the slow addition of O to tetraborane in the IR gas reaction cell. A reaction occurred which produced diborane, partial oxidation product, H, and boric acid anhydride. Mixtures of tetraborane and diborane to which O was slowly added reacted similarly. Argon had no effect on the system under the conditions studied. (Author)

AD-259 139 Div. 4, 25, 30
(7 July 61) OTS price $2.60

North Carolina U., Chapel Hill.
A SENSITIVE POLAROGRAPHIC TECHNIQUE,
by Harry B. Mark, Jr. and Charles N. Reilley.
26 May 61, 23p. illus. tables, 20 refs. (Rept. no. UNC-Chem. no. 8-CNR)
(Contract AF 49(638)333)
(AFOSR-789) Unclassified report

DESCRIPTORS: *Polarographic analysis, Test methods, Electrochemistry, Electrolytes, Sensitivity, Design, Solutions, Lead, Copper, Zinc, Quantitative analysis, Mixtures, Mercury electrodes.

A simple polarographic technique, based upon measuring the difference between the total current in the sample solution and the residual current in the supporting electrolyte solution at a specified time during drop life, was investigated. Concentrations, ranging from 1/1,000,000 to 1/100,000 M, of a single reducible species could be determined to within + or -4/100,000 M. A similar technique permits qualitative and quantitative analysis of mixtures containing two or more reducible species in the 1/1,000,000 M concentration range. These methods were tested with solutions of Pb(++), Cu(++), and Zn(++). (Author)

AD-259 200 Div. 4, 25, 24
(14 July 61) OTS price $1.10

Washington U., Seattle.
CHEMICAL PHYSICS RELATED TO PHOTOGRAPHY,
by William T. Simpson. Mar 60, 6p.
(Contract AF 18(600)375)
(AFOSR TR 60-43) Unclassified report

Reprints referred to in this report are announced separately as AD-259 201 through AD-259 224; these reprints are not supplied by ASTIA.

DESCRIPTORS: *Physical chemistry, *Photography, Quantum mechanics, Electron transitions, Dyes, Colors, Polarization, Molecular spectroscopy, Benzenes, Atomic orbitals, Electrons, Peptides, Chemical bonds, Atomic spectrum, Crystals, Absorption, Valence, Theory, Phenyl radicals, Methanes.

Attempts were made to interweave quantum chemistry and experimental electronic state spectroscopy. The work was divided into subclasses: (1) color of dyes, where typical photographic sensitizer dyes were investigated and the absorption and emission of monomer and dimer species catalogued and interpreted in order to assign transitions; (2) benzene derivatives, where the nature of the symmetry of the low wave functions for the low-lying states of benzene was studied; (3) four pi electrons in 3 pi orbitals, where theoretical and experimental studies were made on amidinium and amides and on the electron dynamics of the peptide link as found in proteins and in photographic gelatin; and (4) electronic spectrum of molecular crystals, which proposed a classification of crystal spectra into 2 categories by whether the energy transfer is fast or slow compared with the Lissajou's figure motion induced in a single molecule by the act of light absorption.

AD-259 310 Div. 4
(11 July 61) OTS price $1.10

Johns Hopkins U., Baltimore, Md.
B-11 QUADRUPOLE COUPLING CONSTANTS IN TRIMETHOXYBOROXINE AND N-TRIMETHYLBORAZOLE.
Technical note no. 15 on Boron Hydride Chemistry, by Walter S. Koski. 1961, 4p. incl. illus. table.
(Contract AF 18(600)1526)
(AFOSR-926) Unclassified report

DESCRIPTORS: *Boron compounds, Hydrides, Alkoxy radicals, Amines, *Borines, Methyl radicals, Oxides, *Quadrupole moments, Nuclear magnetic resonance, Molecular structure, Microwave spectroscopy, Broadband.

A Varian V-4200B NMR spectrometer was used to obtain broad band spectra of trimethoxyboroxine and N-trimethylborazole from which the B-11 nuclear electrical quadrupole interaction was measured. The Townes and Dailey method of analysis (Microwave Spectroscopy, McGraw-Hill Book Co., Inc., N. Y., 1955) is used to estimate the electron configuration of these molecules. The quadrupole coupling constant, eQq/h, of B-11 for one excess p electron is taken as 5.39 mc/sec. In both compounds, the quadrupole interaction split the central transition, m equals 1/2 to - 1/2. A relationship between the derivative maxima, eQq/h and the asymmetry parameter, eta, is given by Silver and Bray (J. Phys. Chem. 29:984, 1958). (Author)

AD-259 311 Div. 4, 20
(11 July 61) OTS price $1.60

Johns Hopkins U., Baltimore, Md.
THE ISOTOPIC-EXCHANGE REACTIONS OF B2H6 WITH DT, HT, AND HD.
Technical note no. 16 on Boron Hydride Chemistry, by Walter S. Koski. 1961, 10p. incl. table.
(Contract AF 18(600)1526)
(AFOSR-927) Unclassified report

DESCRIPTORS: *Boron compounds, Hydrides, *Exchange reactions, Isotopes, Hydrogen, Tritium, Deuterium, *Deuterated compounds, *Tritiated compounds, *Hydrogen compounds, *Diboranes, Chemical reactions, Reaction kinetics, *Pentaboranes, Tracer studies.

The isotope effects in the diborane-hydrogen exchange and in the pentaborane-diborane exchange reactions were studied using deuterium and tritium as tracers. In the former reaction an inverse isotope effect was observed, whereas in the latter a normal isotope effect was obtained. The effects are interpreted in terms of previously proposed mechanisms. (Author)

AD-259 312 Div. 4, 25
(11 July 61) OTS price $1.10

Johns Hopkins U., Baltimore, Md.
THE CRYSTAL STRUCTURE OF BORON TRIIODIDE.
Technical note no. 17 on Boron Hydride Chemistry, by Walter S. Koski. 1961, 9p. incl. tables.
(Contract AF 18(600)1526)
(AFOSR-928) Unclassified report

DESCRIPTORS: *Boron compounds, Diodes, *Crystal structure, Chemical bonds, X-ray diffraction analysis, Powders, Quadrupole moments.

The crystal structure of boron triiodide has been determined by the powder method. The structure is hexagonal with a = 7.00 + or -.01, c = 7.46 + or -.02 angstroms and 2 molecules per cell. The boron-iodine bond distance has been found to be 2.10 + or -.04 angstroms. (Author)

AD-259 319 Div. 4
(10 July 61) OTS price $1.10

Massachusetts Inst. of Tech., Cambridge.
THE PREPARATION OF ORGANOLITHIUM COMPOUNDS BY THE TRANSMETALATION REACTION. II. FERROCENYLLITHIUM,
by Dietmar Seyferth and John F. Helling.
28 June 61, 5p. 12 refs. (Technical rept. no. 6)
(Contract Nonr-184143, Proj. NR 356-391)
Unclassified report

DESCRIPTORS: *Metalorganic compounds, Phenyl radicals, *Lithium compounds, *Ferrocenes, Synthesis, Preparation, Mercury compounds, Chlorides, Ethyl radicals, Chemical reactions, *Metalation.

The systhesis of ferrocenyllithium was undertaken by the transmetalation reaction using ferrocenylmercuric chloride (I) as the starting material. The reaction of I with phenyllithium in ether solution, followed by carbonation gave ferrocenecarboxylic acid and benzoic acid. Similar results were obtained in ether-tetrahydrofuran mixtures. The transmetalation went practically to completion when ethyllithium was used in place of phenyllithium. In another experiment, I and ethyllithium (1:2.5 mol-ratio) were mixed, and solid triphenylchlorosilane was added after 1 hr. Ferrocenyltriphenylsilane was isolated in 66% yield as well as ferrocene in 8% yield. Evidence of some dilithiated product was found when the I-ethyllithium reaction mixture was treated with benzophenone.

AD-259 349 Div. 4
(20 July 61) OTS price $1.10

Illinois U., Urbana.
STUDY LEADING TO THE DEVELOPMENT OF POLYMERS FOR USE IN HIGH TEMPERATURES.
Quarterly progress rept. no. 8, 1 Mar-31 May 61, by Therald Moeller and Antonio Vandi. 31 May 61, 6p.
(Contract DA 11-022-ORD-2956)
Unclassified report

DESCRIPTORS: *Sulfamic acids, *Sulfonamides, *Sulfonyl radicals, *Sulfones, Decomposition, Chlorides, Phosphorus compounds, Phosphoric acids, Benzenes, Phenyl radicals, Magnesium compounds, Metalorganic compounds, Bromides, Bromine compounds, Sulfur compounds, Nitrogen compounds, *Heat resistant polymers, Synthesis, Polymers.

The reaction of sulfamic acid with PCl5, either in the absence or in the presence of a small quantity of CCl4 as a solvent, is an advantageous method for the synthesis of trichlorophosphazosulfonyl chloride. The latter material is an essential intermediate for the preparation of the trimer of sulfanuric chloride. Reactions of bis-trichlorophosphazosulfone and of the chlorides of N,N-dialkylsulfamido-N'-phosphoric acid with Grignard reagents have lead to compounds in which the Cl atoms are all replaced by aryl groups. Thus far, only phenylmagnesium bromide has been caused to react with the corresponding chlorides. The synthesis of the unknown tribromophosphazosulfonyl bromide, by reaction of sulfamic acid with PBr3 and Br in CCl4 or s-tetrachloroethane as solvents, has been also attempted. (Author)

AD-259 353 Div. 4, 25
(20 July 61) OTS price $1.10

Naval Civil Engineering Lab., Port Hueneme, Calif.
CONTROLLED ATMOSPHERE FOR SPECTROCHEMICAL ANALYSIS,
by Raymond J. McGowan. 29 June 61, 4p. incl. illus. (Rept. no. TN-415)
Unclassified report

DESCRIPTORS: *Controlled atmospheres, Cyanogen, Elimination reactions, Gases, Spectrographic data, Test methods, Carbon arc lamps, Nitrogen, *Spectrographic analysis, Chemical impurities, Excitation.

A technique for spectrochemical analysis of various materials was developed which will eliminate the cyanogen bands formed during carbon arcing. Controlling the atmosphere with a quartz vessel proved to be very valuable in carbon arc excitations. It reduces the background intensity and permits longer exposures. With an atmosphere free of nitrogen, the cyanogen bands are eliminated and many of the analytical lines of elements in this region become available, such as lead, cesium, and thallium, between 3000 and 4500 Angstroms. The use of inert atmospheres on highly inflammable materials such as gasoline would permit direct arcing. (Author)

AD-259 365 Div. 4, 25
(11 July 61) OTS price $5.60

David Sarnoff Research Center, Princeton, N. J.
INVESTIGATION OF CARRIER INJECTION ELECTROLUMINESCENCE.
Scientific rept. no. 1, 15 Jan-15 Apr 61, by A. B. Dreeben, A. G. Fischer, and A. S. Mason. 14 May 61, 48p. incl. illus. 30 refs.
(Contract AF 19(604)8018)
(AFCRL-360) Unclassified report

DESCRIPTORS: *Luminescence, Luminescent materials, Light, *Crystals, Lattices, Brightness, Growth, Synthesis, Electrical properties, Zinc compounds, Intermetallic compounds, Semiconductors, Phosphors,

Cadmium compounds, Sulfides, Chemical impurities, Quartz crystals, Electron transitions, Selenides, Tellurides, Electrochemistry, Vacuum systems.

Injection electroluminescence is the conversion of electrical energy into light energy by way of radiative recombination of electrons and holes which are injected from two separate, ohmic contacts, into the volume of a crystal. Many important applications await the practical availability of injection EL light sources. Since the light source is compact, shock-resistant and cool, it might be suitable for special applications such as laser excitation. The preparation of ZnSe crystals suitable for injection EL is discussed. In order to grow better crystals, several methods were developed for melting selenides and sulfides above atmospheric pressure in selenium or sulfur vapors respectively. A new apparatus for Czochralski pulling of decomposable solids under pressure and experiments with controlled zone-sublimation-recrystallization for vapor-phase growth of ZnTe and ZnSe are described. The design and operation of a new vacuum system for epitaxial growth of multiple layers is outlined. (Author)

AD-259 507 Div. 4
(12 July 61) OTS price $3.60

Naval Ordnance Lab., White Oak, Md.
DIFFERENTIAL THERMOGRAVIMETRY OF THE PYROLYSIS OF EPOXIDE POLYMERS,
by Hugh C. Anderson, 16 Jan 61, 27p. incl. illus. tables.
(NAVWEPS rept. no. 7335) Unclassified report

DESCRIPTORS: *Epoxides, *Polymers, *Pyrolysis, Decomposition, *Heat resistant polymers, Molecular structure, Chemical bonds, Polymerization, Copolymerization, Benzenes, Phenols, Anhydrides, Amines, Ethylenes, Carboxylic acids, Catalysts, Phenyl radicals, Stability, *Epoxy resins, Plastics, Gravimetric analysis, Temperature, Time.

The pyrolysis characteristics of 15 epoxide polymers have been investigated, using differential thermogravimetry. The results are discussed in relationship to the chemical structures of the polymerizing agents and epoxide monomers used. It is shown that epoxide polymers having different structures decompose at different rates, as indicated by the differential thermogravimetric curves. On the basis of percentage weight loss at 350 C, a diglycidyl ether of bisphenol (D.E.R.) 332/maleic anhydride polymer was most thermally stable. An Epoxide 201/NMA polymer prepared from nadic methyl anhydride and 3,4-epoxy-6-methylcyclohexylmethyl-3,4-epoxy-6-methlcyclohexanecarboxylate was least stable. (Author)

AD-259 528 Div. 4
(12 July 61) OTS price $1.10

Frick Chemical Lab., Princeton U., N. J.
SOME VISCOELASTIC PROPERTIES OF AMMINE SUBSTITUTED DICHLOROZINC POLYMERS,
by A. Eisenberg, D. Katz, and A. V. Tobolsky. 1960, 6p. incl. illus.
(Contract Nonr-185807)
Unclassified report

DESCRIPTORS: *Polymers, *Zinc compounds, Chlorides, *Ammino compounds, Complex compounds, Molecular structure, Relaxation time, Transition temperatures, Temperature, Elasticity, Viscosity, Physical properties.

An attempt was made to determine the molecular weight, distribution of molecular weights, and the relaxation mechanism of monammine-dichlorozinc. The study of ammine substituted dichlorozincs included determinations of (1) glass transition temperatures; (2) modulus-temperature curves; and (3) maximum relaxation times as function of temperature. Glass transition temperatures were obtained by determining the weight of the samples in toluene as a function of temperature, the inflection point yielding transition temperature value. The results for ZnC12.1/2NH3, ZnC12.1 NH3, and ZnC12.1 1/2 NH3 were close, the values varying between 6 to 11 + or -2. The modulus-temperature curve of the monoammine sample was similar to that of polystyrene or inorganic polymers such as amorphous Se. No rubbery plateau was encountered. A preliminary calculation yielded the value of 30 monomer units for the monoammine on the basis of stress relaxation studies.

AD-259 529 Div. 4, 25
(12 July 61) OTS price $2.60

Frick Chemical Lab., Princeton U., N. J.
VISCOELASTIC PROPERTIES OF AMORPHOUS SELENIUM,
by A. Eisenberg and A. V. Tobolsky. 1960, 22p. incl. illus. tables (Technical rept. no. RLT-33)
(Contract Nonr-185807)
Unclassified report

DESCRIPTORS: *Selenium, *Elasticity, Plasticity, *Viscosity, *Polymers, Inorganic substances, Temperature, Transition temperatures, Relaxation time, Mechanical properties, Liquids, Test methods, Test equipment.

The following viscoelastic properties of plastic Se were investigated: (1) glass-transition temperature (T sub g); (2) Young's modulus as a function of temperature; (3) stress relaxation in simple tension; and (4) determination of the maximum relaxation time above glass-transition temperature (T sub g). Quenching temperature differences had little effect on the T sub g values of the samples. An average of 3 runs gave the T sub g value of Se as 31.0 + or - 0.5. Modulus-temperature curves of samples quenched from 350 and 400 C are reminiscent of those for polystyrene. Stress relaxation and maximum relaxation time studies showed that plastic Se resembles common organic polymers in its viscoelastic behavior at corresponding temperatures. However, it is nearly Maxwellian in the rubbery flow region. An appendix on modified stress relaxation technique for the study of brittle viscoelastic solids is included.

AD-259 539 Div. 4, 25
(14 July 61) OTS price $3.60

Microwave Lab., Stanford U., Calif.
RESEARCH ON RADIATION-INDUCED FREE RADICALS OF SHORT LIFETIME,
by M. Weissbluth and D. Scalapino. June 61, 34p. incl. illus. (Technical rept. no. 1; BL rept. no. 21)
(Contract Nonr-22536, Proj. NR 304-492)
Unclassified report

DESCRIPTORS: *Free radicals, Detection, Microwaves, *Radioactive analysis, Electron beams, Paramagnetic resonance, *Cavity resonators, *Microwave spectroscopy, Electrons.

The detection and study of short-lived free radical intermediates produced by beams of high-energy electrons are described. The Stanford Mk IV electron linear accelerator was the source of high energy electrons and the detection method

employed the techniques of electron paramagnetic resonance (epr) spectrometry. Technical problems associated with the study of the kinetics of free radical intermediates when these are produced by beams of high energy electrons are examined. These problems arise from the fact that one wishes to irradiate a given sample, but inevitably must irradiate other components of the system such as the cavity and sample holder (if there is one); the result is interference with the detection apparatus. Another problem arises from lack of sufficient radiation dose in the sample during a pulse. The indications were that in sufficient concentrations, shorter lived events, to approximately 0.2 sec would be detectable by the same apparatus. (Author)

AD-259 548 Div. 4, 25, 30
(14 July 61) OTS price $1.10

Stanford Research Inst., Menlo Park, Calif.
SUBSTITUTION OF A CATALYTIC PROBE FOR A TUBE OF INFINITE LENGTH IN ATOM RECOMBINATION EXPERIMENTS,
by Bernard J. Wood and A. Bruce King. June 61, 5p. incl. illus.
(Proj. Squid TR SRI-10-P; Contract Nonr-185825, Proj. NR-098-038) Unclassified report

DESCRIPTORS: Jet propulsion, *Recombination reactions, Atoms, *Diffusion, Catalysis, Measurement, Density.

AD-259 582 Div. 4
(14 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
EXPLOSIVENESS OF OZONE-OXYGEN GASEOUS MIXTURES IN METAL VESSELS (Vzryvayemost' Ozono-Kislorodnykh Gazoobraznykh Smesey V Metallicheskikh Sosudakh)
by B. V. Strakhov and V. P. Lebedev. 31 Mar 61, 3p. incl. illus. (Trans. no. MCL-854 of Vestnik Moskovskogo Universiteta, Seriya 2, no. 4:19-20, July-Aug 60)
Unclassified report

DESCRIPTORS: *Ozone, *Oxygen, *Explosions, *Detonation, Pressure vessels, Metals, Glass, Phosphorus compounds, Bronze, Spark ignition, Sparks, Stability, USSR, Gases, Mixtures.

The explosive properties of gaseous mixtures of ozone with oxygen during forced spark explosion in glass vessels depend upon the ozone concentration. (Author)

AD-259 584 Div. 4
(14 July 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE HETEROGENEOUS POLYMERIZATION OF SODIUM ACRYLATE IN THE PRESENCE OF OTHER SALTS,
by V. A. Kargin, V. A. Kabanov, and G. P. Andrianova. 2 May 61, 15p. incl. illus. tables (Trans. no. MCL-849 of Vysoko Molekularnye Soedinenya 2:301-307, 1959)
Unclassified report

DESCRIPTORS: *Acrylic resins, *Polymers, *Polymerization, Solids, Crystals, *Sodium compounds, Lithium compounds, Magnesium compounds, Ethanol, Chlorides, Exchange reactions, Chemical reactions, Mixtures, *Metalorganic compounds, Salts, USSR.

In this work, it has been shown that, in order to initiate polymerization of crystalline sodium acrylate in the system: sodium acrylate-LiCl-50% $C_2H_5OH$ and sodium acrylate-$MgCl_2$-aqueous $C_2H_5OH$, a heterogeneous exchange reaction between the salts must be used. Formation of a new solid crystalline phase and its contact with monomer salt crystals, plays a substantial role in the initiation process. (Author)

AD-259 588 Div. 4
(14 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
INVESTIGATING THE NATURE OF SECONDARY CHEMICAL BONDS (Issledovaniye Prirody Vtorichnykh Khimicheskikh Svyazey).
20 Mar 61, 8p. 13 refs. (Trans. no. MCL-845 of Doklady Akademii Nauk SSSR 133:178-181, 1960)
Unclassified report

DESCRIPTORS: *Chemical bonds, *Molecules, *Electrons, Atoms, *Atomic orbitals, USSR, *Metalorganic compounds, *Lithium compounds, *Complex compounds, Infrared spectroscopy, Polymerization, Catalysts, Ethylenes, Boron compounds, Beryllium compounds, Aluminum compounds.

Secondary chemical bonds and their influence on the physical and chemical properties of metal-organic compounds are discussed. The phenomena of generalizing valence electrons of primary bonds accompanying the origin of multicenter molecular orbits with secondary bond development have been observed in large classes of compounds. The theory postulates that as strong chemical bonds are formed due to direct reaction of valence electrons of adjoining atoms, secondary (less durable) bonds develop due to the monovalent electrons created by energy changes in the molecule. IR spectroscopy was used to study Li-organic compounds. Experimental proof of generality in the nature of secondary chemical bonds (promoting metalorganic bonds of Li, Be, B and Al) is the existence of mixed complexes between such compounds: R-Li.Be(R)2.

AD-259 615 Div. 4
(17 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
EVAPORATION OF SILICON IN TELLURIUM VAPORS,
by V. E. Kosenko and B. A. Nesterenko. 26 May 61, 6p. incl. illus. (Trans. no. MCL-1093 of Fizika Tverdogo Tela 3:660-662, Feb 61)
Unclassified report

DESCRIPTORS: *Silicon, *Tellurium, Vapors, Gases, Vapor pressure, Pressure, Evaporation, Single crystals, *High temperature research, *Heat of sublimation, Thermodynamics, USSR.

A study was made of the evaporation rate of single-crystal silicon in tellurium vapors at temperatures of 700-1150 C. At 1000 the evaporation rate monotonically increases with increasing pressure of tellurium vapors and at a pressure of 100 mm Hg exceeds the evaporation rate of silicon in vacuum by more than a million times. It is shown that the heat of evaporation

of silicon decreases with increasing pressure of tellurium vapors, the heat of evaporation was equal to 13.8 kcal/mole at 100 mm Hg, which is 7.5 times smaller than the heat of evaporation in vacuum. (Author)

AD-259 664 Div. 4
(17 July 61) OTS price $3.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
THE SYNTHESIS AND FLASH PHOTOLYSIS OF 1-PROPANEAZOETHANE.
Master's thesis,
by William Asa Rush. Mar 61, 32p. incl. illus. tables, 19 refs. (Rept. no. GNE/Phys/61-17)
Unclassified report

DESCRIPTORS: *Ethanes, *Propanes, Ethyl radicals, *Azo radicals, *Synthesis, Free radicals, *Photolysis, Propyl radicals, Ultraviolet radiation, Nitrogen, Chemical reactions, Reaction kinetics, Hydrazines, Recombination reactions, Disproportionation.

The relative rate constants for the reactions between ethyl and n-propyl free radicals are required for radiolysis calculations. The preliminary phases of an investigation to determine these constants have been completed. 1-Propaneazoethane ($C_2H_5NNC_3H_7$) was selected as the source of free radicals. A synthesis was devised from hydrazine and accomplished. The compound was decomposed by exposure to high energy bursts of ultraviolet radiation from a flashtube. This decomposition resulted in the formation of nitrogen, ethyl free radicals, and propyl free radicals. A reaction scheme for the radicals was proposed and equations for the relative rate constants, in terms of product concentrations, derived. The product concentrations were then determined by gas chromatography, but the initial results are too sparse and scattered to permit substantiated calculation of the constants. (Author)

AD-259 715 Div. 4
(18 July 61) OTS price $2.60

Florida U. Engineering and Industrial Experiment Station, Gainesville.
FLUOROCARBON N-F COMPOUNDS.
Quarterly technical rept. no. 8,
by J. A. Young and R. D. Dresdner. 1961,
21p. incl. illus. tables.
(Contract DA 01-009-ORD-772)
(ARPA order no. 40-59, Task no. 3)
Unclassified report

DESCRIPTORS: *Fluorocarbons, *Nitrogen compounds, *Fluorides, Cesium compounds, Synthesis, Imines, Sulfur compounds, Nitriles, Imides, Carboxylic acids, Chemical equilibrium, Alkyl radicals, Reaction kinetics, Substitution reactions, Molecular structure, Propenes, Catalysts, Nuclear magnetic resonance.

Compounds formed by both flow and static reaction over CsF are identified. The former yields mainly $(CF_3)_2CFCF(CF_3)_2$ and $(CF_3)_2C{:}CFCF_2CF_3$, a much smaller amount of $(CF_3)_2CFCF{:}CFCF_3$, and a trace of $(CF_3)_2CFC(CF_3){:}CF_2$, while the latter gives predominantly $(CF_3)_2C{:}CFCF_2CF_3$, a trace of $(CF_3)_2CFCF(CF_3)_2$, and substantial amounts of compounds smaller or larger than C6. The effect of CsF on fluorocarbon imino sulfur difluorides at 250 degrees is to reverse the method of formation of the latter to give the parent nitrile and $SF_4$. Study of various nitrile-carboxylic acid systems discloses that an equilibrium exists between the reactants and the resultant imide. By varying the nature of the alkyl groups in both acid and nitrile, observations can be made concerning the effect of F substitution on the position of the equilibrium and on the rate of reaction. Attempts are made to relate the observed variations to molecular structure. (Author)

AD-259 724 Div. 4
(18 July 61) OTS price $1.10

Iowa State U. of Science and Tech., Ames.
STRUCTURAL INTERRELATIONSHIP OF INDOLE ALKALOIDS.
Quarterly rept. nos. 9 and 10, 1 Nov 60-30 Apr 61,
by Ernest Wenkert. 30 Apr 61, 13p. incl. illus.
(Contract DA 18-108-405-cml-269)
Unclassified report

DESCRIPTORS: *Indoles, *Alkaloids, *Molecular structure, Synthesis, Reduction, Chemical reactions.

ATTEMPTED SYNTHESIS OF ERYTHROCENTAURIN: Orthotoluic acid was nitrated. The mixture of ortho and para products was converted to acid chloride with thionyl chlorides, to amide with $NH_3$, and to nitrile with phosphorous oxychloride. Separation of the mixtures led to the desired compound. NEW METHODS FOR THE SYNTHESIS OF INDOLE ALKALOIDS: 2-Methyltryptophol was made by the Fischer indole synthesis involving levulinic acid and phenylhydrazine and by an $LiAlH_4$-reduction of the resulting ester. 1-Methyltryptophol was prepared by a Fischer indole reaction of N-methylphenylhydrazine and alpha-keto-glutaric acid, acid-catalyzed decarboxylation of the resulting diacid, esterification, and $LiAlH_4$-reduction.

## 5. COMMUNICATIONS

AD-259 056 Div. 5
(6 July 61) OTS price $4.60

Marine Corps Equipment Board, Quantico, Va.
COMMUNICATIONS CENTRAL AN/TSC-15.
28 June 61, 41p. incl. illus. tables.
(Proj. no. 43-60-23)
Unclassified report

DESCRIPTORS: *Radio communication systems, *Multiplex transmission, *Voice communication systems, *Teletype systems, Mobile, Sidebands, *Telegraph systems, *Military communications, Tests, Communication equipment, Reliability.

Communications Central AN/TSC-15 was tested to determine its suitability for Marine Corps use, and to determine its suitability for use as a replacement for Radio Sets AN/MRC-30, AN/MRC-32, AN/MRC-62 and AN/TRC-27. The central AN/TSC-15, is a complete, HF, single sideband communication system. It consists of radio set AN/TRC-75, an additional receiver-exciter, a 4-channel voice multiplexer, a 4-channel teletype multiplexer, a teletypewriter and a cordless switchboard all installed in a modified S-155 helicopter transportable shelter. The equipment is capable of

simplex or duplex operation in upper sideband suppressed carrier, lower sideband suppressed carrier, compatible AM, twin sideband suppressed carrier and independent sideband suppressed carrier. (Author)

AD-259 090 Div. 5
(6 July 61) OTS price $11.50

RCA Defense Electronic Products, Camden, N. J.
VARIABLE BANDWIDTH FM TRANSMISSION SYSTEM,
by J. E. Palmer, W. J. Hannan and others.
30 Apr 61, 143p. incl. illus. tables, 43 refs.
(Contract AF 30(602)2318, Proj. 4519)
(RADC TR 61-124) Unclassified report

DESCRIPTORS: Frequency modulation, *Radio communication systems, Radio signals, Scattering, Atmosphere, Radio interference, Reduction, Data transmission systems, Mathematical analysis, Satellite vehicles, Recording devices, Magnetic tape, Signal-to-noise ratio, Attenuation, Diversity systems, Extraterrestrial radio waves, *Radio transmission.

An important trend in modern communications is toward adaptation of some parameter of a system in order to improve or optimize system performance. While it has been common practice to design the system around the worse case expected, a system is proposed in which data rate would be varied by adjusting the transmitted bandwidth in accordance with the prevailing conditions. The major advantage of such a design technique is efficient use of the communications channel, especially in systems such as forward propagation tropospheric scatter where the received signal power varies over a wide range. By utilizing the variable bandwidth technique, a constant signal-to-noise ratio is maintained at the input of a receiver detector. Detailed investigations are included of several diversity systems, feedback loop stability, effects of errors in measurement and transmission of the control signal, effects of system delay, tape machine design and over-all system configuration. Results indicate that addition of the variable bandwidth scheme to present fixed bandwidth systems can offer at least a 12 db improvement in performance. The use of variable bandwidth transmission to compensate for changes in path length, atmospheric attenuation and antenna non-isotropism in satellite communication systems is also discussed. (Author)

AD-259 141 Div. 5
(7 July 61) OTS price $5.60

New York U. Coll. of Engineering, N. Y.
IMPROVEMENT OF TWO-WAY COMMUNICATION BY MEANS OF FEEDBACK,
by Leonard S. Schwartz, Harold K. Work, and Charles F. Hobbs. 15 Mar 61, 55p. incl. illus. tables, 20 refs. (Scientific rept. no. 5)
(Contract 19(604)6168)
(AFCRL-178) Unclassified report

DESCRIPTORS: *Communication systems, *Communications theory, Data transmission systems, Reliability, Coding, Synthesis, Errors, Feedback, Digital systems.

A general synthesis technique is presented for feedback systems with block codes. A theorem is derived which shows the equivalence in performance between various feedback systems. Codes for transmitting the decision signal are discussed, and a state transition diagram for analyzing the effects of decision signal errors is introduced. A conclusion which can be drawn from the theoretical developments is that decision feedback is the basic and most desirable form to use for simultaneous communication in both directions. Compound and information feedback should play supplementary roles and should be called upon only to speed up to transmission in one direction if the other channel is not in use for message transmission. In switching a two-way decision-feedback system to a compound- or information-feedback system little added equipment is necessary. The improvement of feedback systems over unidirectional systems can be readily estimated for channels with independent errors. However, the improvement is much greater under fading situations (or long burst errors), as is illustrated in an example. The methods discussed are general and versatile enough to cope with practically any situation. (Author)

AD-259 164 Div. 5, 12, 8
(10 July 61) OTS price $3.60

Aerospace Corp., El Segundo, Calif.
USE OF AUTOMATIC ANGLE RETURN ARRAYS FOR COMMUNICATIONS SATELLITES,
by R. C. Hansen. Apr 61, 36p. incl. illus. table, 22 refs. (Rept. no. TDR-594(1321-01)TR-2)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: *Satellite vehicles, Automatic, *Radio communication systems, Reflectors, Radio waves, Radio signals, *Satellite vehicle antennas, Stabilization, Radio relay systems, Reliability, Communication systems, Antennas, Communication equipment.

An investigation is made of automatic angle return satellite arrays for both passive and active systems. Automatic angle return arrays, called Van Atta arrays, return a signal in the direction of incidence of the impinging signal, and are effective over an angle of at least + or - 45 degrees from the array axis. As a result, only partial stabilization, or single-axis (spin) stabilization is required, which greatly simplifies the station-keeping, orbit control problem. Further, the active Van Atta array (AVA) offers inherent high reliability, since many of the distributed amplifiers may fail without causing serious system performance degradation, and also because the distributed amplifier arrangements permit the use of low-power, solid state devices. (Author)

AD-259 248 Div. 5, 8
(11 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
METHOD OF MULTICHANNEL COMMUNICATIONS (Sposob Mnogokanal'noy Svyazi),
by L. A. Korobkov. 2 May 61, 1p. (Trans. no. MCL-893 of Byulleten' Izorbeteniy 11: p. 24, 1960).
Unclassified report

DESCRIPTORS: USSR, Technological intelligence, *Communication systems, *Communications theory, Storage tubes.

AD-259 467 Div. 5, 6, 8
(13 July 61) OTS price $16.50

Technical Military Planning Operation, General Electric Co., Santa Barbara, Calif.
MODEL RADIO COMMUNICATION NETWORK (U.S.S.R.).
1 June 61, 245p. incl. illus. tables (Rept. no.

RM61TMP-50)
(Contract AF 18(600)1808)
(AFCRL-374)
(ARPA Order no. 6-60) Unclassified report

Original contains color plates: All ASTIA reproductions will be in black and white. Original may be seen in ASTIA Hq.

DESCRIPTORS: USSR, *Radio communication systems, Geography, *Antennas, Monitors, *Telemeter systems, *Microwave relay systems, Radio relay systems, *Radio stations, *Telephone communication systems, *Telegraph systems, *Television communication systems, Maps, Communication systems, *Microwave communication systems, Military communications, Satellite vehicles, Tracking.

An essay is presented to establish the geographic distribution and the operating characteristics of the USSR, radio communication system. The reported system may be a naive representation of whatever system exists. However, it has value in representing one version of the radio communications network required to coordinate civilian and military activities within the Soviet Union. Emphasis is placed on the natural areas of expansion dictated by the Soviet Union's climatological and topological characteristics. Because of the unclassified nature of all sources great freedom may be exercised in utilizing this material. Special emphasis was placed on the Asiatic portion of the Soviet Union, but the most important facilities and new developments in the European portion are also covered. All available information on frequencies, location, and equipment was included, but material of doubtful validity was omitted. (Author)

AD-259 554 Div. 5, 8
(13 July 61) OTS price $6.60

RCA Defense Electronic Products, New York.
METHODS FOR PROVIDING AN ORDER WIRE FOR PCM COMMUNICATIONS SYSTEMS.
Final rept. on Task 7,
by R. Gardner and A. A. Meyerhoff. 31 May 61, 60p. incl. illus. 10 refs. (Rept. no. CR-61-419-16)
(Contract DA 36-039-sc-78045)
Unclassified report

DESCRIPTORS: Pulse modulation, *Radio communication systems, Coding, *Multiplex transmission, Amplitude modulation, Maintenance, Microwave relay systems, *Radio relay systems, Frequency modulation, Interference, Signal-to-noise ratio, Theory, Errors.

A study was made of means by which an order wire can be added to a multichannel PCM communication system. The principal use of an order wire is a separate communication channel for maintenance personnel. Two methods for providing an order wire were studied in detail. The first method consists of modulating the amplitude of the baseband PCM pulse train with the order wire signal. The second consists of amplitude modulating the final frequency-modulated signal which is transmitted at radio frequencies. For each method, the amount of additional signal power which is required to avoid having the order wire modulation impair the traffic channel quality was determined. The degree of modulation which is required for an order wire was determined as a function of the desired order wire quality. The effects of receiver noise and intersymbol interference on binary and higher order systems was evaluated analytically. The results show that both methods are theoretically feasible. (Author)

AD-259 558 Div. 5, 8
(14 July 61) OTS price $2.60

RCA Defense Electronic Products, New York.
EXPERIMENTAL DETECTOR STUDY.
Final rept. on Task 3,
by A. Tepfer. 28 Apr 61, 17p. incl. illus.
(Rept. no. CR-61-419-13)
(Contract DA 36-039-sc-78045)
Unclassified report

DESCRIPTORS: *Pulse modulation, *Coding, Frequency modulation, Detectors, Radio communication systems, Band pass filters, Intermediate frequency amplifiers, Electronic circuits, Errors, Test equipment, Design, Intermediate frequency filters, *Radio relay systems, *Microwave communication systems.

A laboratory study of error-rate performance of a PCM-FM system and an investigation of some experimental detector techniques were conducted. The variation of the error rate as a function of the signal strength was determined as the frequency deviation was varied and as the carrier frequency was displaced from its normal position in the middle of the IF amplifier. This was done for both the normal gaussian shaped IF amplifier passband and also for a wider IF passband. The effects of carrier reinsertion in the receiver and of a time-varying IF filter synchronous with the received signal were investigated. (Author)

AD-259 596 Div. 5
(27 July 61) OTS price $2.60

Coordinated Science Lab., U. of Illinois, Urbana.
ON ORIENTED COMMUNICATION NETS,
by Wataru Mayeda. June 61, 25p. incl. illus. tables (Rept. no. R-128)
(Contract DA 36-039-sc-85122)
Unclassified report

DESCRIPTORS: Electric terminals, Matrix algebra, *Communication systems, *Communications theory, Synthesis, Mathematical analysis.

The solution is presented to an important problem associated with an oriented communication net. The problem is to obtain the maximum number of different values of terminal capacities in the net. Tang and Chien give an interesting condition for realizability of terminal capacity matrices of oriented communication nets. It is shown that this condition is not sufficient. A sufficient condition for realizability of terminal capacity matrices of oriented communication nets is given which is more general than the necessary and sufficient conditions for the non-oriented communication net. The net whose terminal capacity matrix satisfies the above sufficient condition can have at most 2(v-1) different terminal capacities where v is the number of vertices in the net. Notice that there are at most v-1 different terminal capacities in a non-oriented communication net. (Author)

AD-259 756 Div. 5, 8
(18 July 61) OTS price $3.60

Research and Advanced Development Div., AVCO Corp., Wilmington, Mass.
PREDICTED PERFORMANCE OF A HIGH-FREQUENCY POLAR-

COMMUNICATION NETWORK DURING AN IONOSPHERIC STORM.
Scientific rept. no. 9, on Research Concerning Forecasting Anomalous Propagation at High Latitudes,
by Norman J. Macdonald, Rudolf Penndorf and Geoffrey E. Hill. Apr 61, 44p. incl. illus. tables (Technical rept. no. RAD-TR-61-17)
(Contract AF 19(604)4092)
(AFCRL-139) Unclassified report

DESCRIPTORS: *Radio communication systems, High frequency, Propagation, Ionspheric disturbances, Radio interference, *Ionospheric propagation, Magnetic storms, Statistical analysis, Tables, Arctic regions.

The knowledge of space and time variations of fmim, foEs, and foF2 during periods of intense polar ionospheric disturbances can be used to design an efficient and highly reliable high-frequency polar-middle latitude communication system. Ionospheric data for a September 1957 storm have been analyzed, proving the feasibility of a frequency link-switching technique. (Author)

AD-259 790 Div. 5, 30
(19 July 61) OTS price $11.50

RCA Defense Electronic Products, New York.
PCM TROPOSCATTER ERROR INSTRUMENTATION SYSTEM. Final rept. on Microwave Radio Relay Study (Instruction Manual),
by A. Tepfer. 28 Apr 61, 157p. incl. illus. tables (Rept. no. CR-61-419-11)
(Contract DA 36-039-sc-78045)
Unclassified report

DESCRIPTORS: *Instruction manuals, Microwave relay systems, Data transmission systems, *Microwave communication systems, Radio waves, Atmosphere, Scattering, Frequency modulation, Pulse modulation, Coding, Errors, Digital systems, Probability, *Radio communication systems, *Radio relay systems, Reliability, Instrumentation, Tests, Recording devices.

A fixed installation system was developed and built to determine the error rates and the error rate probability distributions of binary digit communications systems. Ten minute test runs using a bipolar alternate mark and space signal at a 576 kilobit/sec rate can be conducted automatically, and the system performs the initial data reduction. The instrumentation system is compatible with the AN/GRC-50 and the AN/GRC-66 radio sets. Both the properties of the propagation medium and also the communication equipments can be tested. (Author)

AD-259 970 Div. 5
(July 61) OTS price $8.60

ITT Federal Labs., Fort Wayne, Ind.
VIEWING SET TELEVISION AN/FXC (XW-1).
Final technical rept.,
by Nelson Hoag and Jerry Holsinger. 30 June 61, 79p. incl. illus. table (Serial no. 3006)
(Contract AF 30(602)1951)
(RADC TR 61-89) Unclassified report

DESCRIPTORS: *Television communication systems, *Television transmitters, *Telephone lines, *Secret communication systems, Data transmission systems, Digital systems, Coding, Television equipment, Storage tubes, *Television display systems, *Image tubes, Design, Reliability, Maintenance.

Viewing set, television AN/FXC (XW-1) is capable of transmitting graphic information such as weather charts, briefing status boards, etc., over telephone lines having a bandwidth of approximately 300 to 3000 c, phase equalized from 1000 to 2500 c. Picture definition is a function of transmission time and as several different frame times are provided, pictures of varying qualities may be transmitted. A 400-line picture is the highest resolution information that can be transmitted. A 2-way audio link and a real-time pointer system at the transmitter provides a system of maximum utility. Secure transmittal of information is assured when the system utilizes approved security devices. Also presented are the relative merits of 2 approaches, the scan conversion and direct slow scan modes, performed on this development. A summary of the AN/FXC (XW-1) performance is included. (Author)

## 6. DETECTION

AD-259 123 Div. 6, 12
(7 July 61) OTS price $13.00

Ballistic Research Labs., Aberdeen Proving Ground, Md.
DOPLOC OBSERVATIONS OF REFLECTION CROSS SECTIONS OF SATELLITES.
Rept. for 1 Jan 59-1 July 60,
by Harold T. Lootens. Mar 61, 187p. incl. illus. tables (BRL memo. rept. no. 1330)
(Proj. 503-06-011)
(ARPA Satellite Fence Series rept. no. 22)
Unclassified report

DESCRIPTORS: *Satellite vehicles, *Satellite vehicle trajectories, Tracking, *Orbital flight paths, *Doppler tracking, Radar tracking, Instrumentation, Antennas, Signal-to-noise ratio, Antenna radiation patterns, Doppler systems, Data processing systems, Radar reflections, Radio doppler chronographs, *Radio equipment, Meteors, Bibliography.

An analysis was made of reflection cross sections observed for 8 satellites using the DOPLOC dark satellite detection system developed by the Ballistic Research Laboratories. Several related areas are discussed: i.e., satellite signature, spin and tumble, scintillation and ionized trails. A brief description of the DOPLOC receiving system and antenna configuration is included. The method used for calculation of cross sections is given. (Author)

AD-259 134 Div. 6, 19
(10 July 61) OTS price $17.00

Stewart Warner Corp., Chicago, Ill.
ANALYSIS AND COMPARISON OF THE SETRIN AND STEWART-WARNER ATC RADAR BEACON INTERROGATION PATH SIDE LOBE SUPPRESSION/REFLECTION SUPPRESSION SYSTEMS.
Final engineering rept.
Jan 60, 1v. incl. illus. (Rept. no. SLS-959)
(Contract FAA/BRD-62)
Unclassified report

DESCRIPTORS: *Radar beacons, *Radar pulses, Lobing, *Radar antennas, Antennas, *Antenna radiation patterns, *Air traffic control systems, Reflection, Plan position indicators, Errors, Reduction, *Identification systems, Airborne, Coding, Electronic circuits, Design, Flight testing, Effectiveness, *Radar equipment.

Evaluations and comparisons are made of the Stewart-Warner and Setrin side lobe suppression/reflection suppression systems, both of which are 3 pulse systems. The comparative effectiveness of each in eliminating side lobe and reflection interrogations and the possible problem areas of each are discussed. Antenna configurations to accomplish the desired suppressions are described. Additional system improvements are suggested. It is shown that it is possible for a 3 pulse system to accomplish complete side lobe and reflection interrogation suppression. The extent of side lobe suppression/reflection suppression desired will determine the system and equipment requirements. (Author)

AD-259 163 Div. 6
(10 July 61) OTS price $1.10

Army Arctic Test Board, Fort Greely, Alaska.
SERVICE TEST OF RADAR SET AN/TPS-25.
15 June 61, 6p. (Proj. no. ATB 1-141)
Unclassified report

DESCRIPTORS: Arctic regions, *Doppler radar, *Moving target indicators, Mobile, *Search radar, *Position finding, Surface targets, X band, Temperature, Reliability, Tests, Detection, Radar equipment.

Tests were conducted to determine the suitability of Radar Set AN/TPS-25 for artillery use under arctic winter conditions. Radar set AN/TPS-25 (test radar) is a vehicular transportable, noncoherent doppler type, moving target radar. The target detection is by aural means (headset or loudspeaker) and also by display on an oscilloscope. The target location is furnished on counters giving ground range, azimuth, and elevation, in addition to the X and Y coordinates of the target. The target location is also furnished on a map overlay board using 1:25,000 or 1:50,000 maps. The antenna can be operated remotely at vantage points up to 225 ft from the shelter position. The test radar operates at a frequency of 9,375 mc plus or minus 30 mc with a peak power output of 43 kw. The test radar was designed to detect the presence of and locate moving targets at ranges from 450 to 18,280 m. It will automatically search a sector 180, 360 or 540 mils wide and 900 m deep as chosen by the operator. The radar was emplaced and exposed to the arctic winter environment. Ambient temperatures during tests ranged from 35 F to -49 F. It was concluded that the Radar Set AN/TPS-25 should be suitable for army use under arctic winter conditions when certain deficiencies are corrected. (Author)

AD-259 258 Div. 6, 2
(11 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
LARGEST REFRACTION TELESCOPE IN EUROPE.
20 Apr 61, 2p. incl. illus. (Trans. no. MCL-856 of Ekonomicheskaya Gazeta 17, pp. 4, 20 Jan 61).
Unclassified report

DESCRIPTORS: *Telescopes, Tracking telescopes, Optical instruments, Europe, Reflectors, Tests, Effectiveness.

A new reflecting telescope was installed in the Tautenberg Observatory in the German Democratic Republic, having a 2-m-diam. mirror, it belongs to the largest reflector in the world. In Europe, it yields only to the 2.6-m telescope under construction in the Soviet Union. The telescope's main parts are: a 2-m-diam. concave mirror, a 1.34-m-diam. correcting plate, a photographic system having 4-m focal distance and a 1 to 3 aperture ratio. The telescope is capable of studying large areas of the sky. These sections can be photographed on 24 x 24 cm plates. This multipurpose unit is made up outwardly of an approximately 10-m long tube with a square cross-section and a parallax stand. The stand can make the telescope track a celestial body with extraordinary precision by means of a timing device. The movable section weighs 65,000 kg, therefore, special adjustments composed of forced lubrication bearings are required for the precision control of the telescope. By means of an accurate 2160-mm-diam. worm gear, the telescope can be made to rotate. The unit of the 26,000 kg tube, set at an angle determined with respect to the axis of declination in a system of astronomical coordinates, operates automatically from a central and from several complementary control panels. (Author)

AD-259 451 Div. 6, 22
(13 July 61) OTS price $8.60

Electro-Optical Systems, Inc., Pasadena, Calif.
DESIGN AND FABRICATION OF EXPERIMENTAL STRESSED-PLATE SHUTTER SYSTEMS.
Final rept. on Phase 1,
by S. M. Hauser, D. G. Marlow, and L. S. Smith.
20 May 61, 86p. incl. illus. tables.
(Contract DA 04-495-ORD-1995)
Unclassified report

DESCRIPTORS: *Optical systems, *Photoelectric shutters, Atomic bomb explosions, Thermal radiation, Countermeasures, Piezoelectric materials, Photoelasticity, Optical instruments, Safety devices, Design, Tests, Binoculars, Nuclear explosions.

The report describes the design, fabrication, and testing of two experimental models of a large aperture stressed-plate shutter to be used in investigating its potential as a practical anti-flash device. Unclassified performance requirements of anti-flash shutters are reviewed along with the operation of the stressed-plate shutter concept. Details of physical design and assembly are presented with attention given to a review of the best choice of materials and the matching of the physical characteristics of these materials to optimize the overall shutter performance. The room temperature performance of the stressed-plate shutter indicates extinction ratios in the range of 0.001 to 0.0001 with damped closure times on the order of 75 microseconds. Definitive tests of the shutter system at low and high temperatures were not performed. Maintenance and operation of the pulsing circuitry are discussed. (Author)

AD-259 478 Div. 6, 15
(14 July 61) OTS price $2.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
DISTRIBUTION OF THE NORMALIZED PERIODOGRAM DETECTOR,
by R. P. Wishner. 26 June 61, 18p. (Rept. no. 47G-0027)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: Radar ranges, *Radar signals, Doppler radar, *Noise (Radar), *Statistical analysis, Statistical distributions, *Detectors, Video signals, Sampling, Probability, Doppler systems.

The normalized periodogram detector or ratio detector can be shown to perform the likelihood ratio test for detecting range-sampled Doppler-modulated sine waves in Gaussian noise of constant but unknown intensity. The distribution function (df) and probability density function of this detector are derived. From the df the probability of false alarm and the probability of detection are easily found. (Author)

AD-259 562 Div. 6, 22
(14 July 61) OTS price $2.60

Telemetering Corp. of America, Sepulveda, Calif.
DESIGN STUDY OF AN INTEGRATED AIRBORNE TELEMETRY SYSTEM.
Progress rept. no. 11 (Final),
by Hugh Pruss. Aug 60, 23p. incl. illus.
(Engineering rept. no. 707)
(Contract DA 28-017-501-ORD-3577, Proj. TN2-8106)

Unclassified report

DESCRIPTORS: *Telemeter systems, Airborne, Multiplex transmission, Frequency modulation, *Telemetering transmitters, Transistors, *Rockets, Data transmission systems, Very high frequency, Mixer tubes, Radiofrequency amplifiers, Amplifiers, Calibration, Crystal oscillators, Power amplifiers, Electronic circuits, Design, Packaging, Tests.

The rocket telemeter study program was completed in the following phases of work: (1) determination of accuracy and data requirements, (2) theoretical analysis of modulation methods, (3) comparative analysis of system capabilities, (4) survey of flight test range facilities, (5) preliminary system design, (6) component development and breadboard testing, and (7) feasibility model fabrication, test and delivery. New approaches to system and component design were required. The completed feasibility rocket telemeter system design represents a state-of-the-art advancement in an extremely compact, accurate and efficient telemetry system of high data capability. It is believed that this study program resulted in the development of the first 400 mw, true FM, all transistor transmitter. (Author)

AD-259 575 Div. 6, 2
(14 July 61) OTS price $8.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
RADAR ECHOES FROM AURORAE,
by B. A. Bagaryatskiy. 26 May 61, 83p. incl. illus. tables, 86 refs. (Trans. no. MCL-1078 of Uspekhi Fizicheskikh Nauk 73:197-241, 1961)

Unclassified report

DESCRIPTORS: *Radar-echo areas, *Aurorae, Ionosphere, Ionospheric disturbances, USSR, Technological intelligence, Reflection, Radio waves, *Radar reflections, Ionization, Electromagnetic wave reflections.

An attempt is made to survey the data available in the literature and to give basic information on the nature of auroral radar echoes. The formation of auroral ionization during upper-atmosphere atomic explosions is especially interesting. High ionization density, causing the appearance of stable USW-echoes within tens of minutes, is noted not only in the explosion zone but also (after a brief time) at a distance of several thousand kilometers at a magnetically conjugate point of the opposite hemisphere. This is an interesting phenomenon from the point of view of an understanding of the properties of the earth's radiation belts, not to mention the related possibility of refining the structure of the earth's magnetic field. The investigation of auroral radar echoes is also very important for radio communication, particularly in the broad expanses near the auroral zones. (Author)

AD-259 736 Div. 6, 30
(18 July 61) OTS price $8.60

New York U., Coll. of Engineering, N. Y.
SPECIAL PURPOSE ANALYSIS TECHNIQUES.
Quarterly rept. no. 3, 1 Jan-31 Mar 61,
by R. Archbald, D. Hoffman and others. 31 Mar 61, 90p. incl. illus.
(Contract DA 36-039-sc-84968, Proj. 3-99-06-001-01)

Unclassified report

DESCRIPTORS: *Radio signals, *Radio interception, *Radar signals, *Radar interception, Identification, *Direction finding, Automatic, *Digital computers, Countermeasures, Radar pulses, Pulse analyzers, Radar scanning, Display systems, *Loop antennas, Antennas, Signal-to-noise ratio, Antenna radiation patterns, Analog to digital converters, Calibration, Radar receivers, Pulse modulation, Radar interconnecting assemblies, Analysis.

Progress is described in the development of a miniaturized automatic direction finding system. A method of calibration is given for units of the system that were packaged in final form. The linearity requirements on a receiver are detailed. Two different antenna arrays are described which can be used with the direction finder. An experimental program for determining the feasibility of using a general purpose digital computer for signal analysis problems was started. The Packard-Bell Company 250 computer and countermeasures receiving set AN/TLR-1 are the major units are explained. A method for using a digital computer to control the operation and interpret the output of a direction finding unit for pulse signals is described. Techniques for implementing the system are outlined. Computer programs to perform the desired system control and data interpretation are developed. (Author)

AD-259 775 Div. 6, 30
(18 July 61) OTS price $.50

Director of Defense Research and Engineering, Washington, D. C.
STANDARD PROCEDURE FOR TARGET AND BACKGROUND INFRARED MEASUREMENT,
by Charles Ravitsky, Cameron Cumming, and Trevor S. Moss. Apr 61, 14p.

Unclassified report

DESCRIPTORS: *Thermal Targets, Infrared research, *Infrared radiation, Measurement, Infrared spectroscopy, Standards, Atmosphere, *Radiometers, Infrared detectors, Calibration, Absorption, Scattering, Research program administration, Sources.

Contents:
Radiation sources: targets, background
Measurement of characteristics of targets, backgrounds, and intervening media
Target characteristics and methods of measurement: target emission, radiometer design, use and calibration of radiometers, reflection, obscuration, secondary targets or transposed characteristics

# Division 7 - ELECTRICAL EQUIPMENT

Background characteristics
Interaction of targets and backgrounds or contrast detection: field chopper discrimination, spatial variation, temporal variation
Intervening media: absorption, scattering, scintillation
Auxiliary measurements and data: general data, meteorological measurements, geometrical measurements, auxiliary target specifications
Units and symbols
Presentation of data: reduced and primary data, graphical data preferred, units of measurement

AD-259 828 Div. 6, 12
(19 July 61) OTS price $2.60

Telemetering Corp. of America, Sepulveda, Calif.
DESIGN STUDY OF AN INTEGRATED AIRBORNE TELEMETRY SYSTEM,
Progress rept. no. 13 for Oct 60.
by Hugh Pruss. Oct 60, 21p. incl. illus. tables.
(Engineering rept. no. 707-P-154-1)
(Contract DA 28-017-501-ORD-3577, Proj. TN2-8106)
Unclassified report

DESCRIPTORS: *Telemeter systems, Design, Airborne, Pulse modulation, Coding, Synchronizers, Telemetering data, Measurement, Guided missiles, Satellite vehicles, Errors, Space probes, Data transmission systems, Probability.

Research was continued on an integrated airborne telemeter system. Research of various missile and space vehicle data measurements was conducted to provide a basis for specific PCM system design parameters. For detail analysis of the measurement data content, the measurements were separated into the following 3 categories of classification: (1) type of measurements versus number of measurements, (2) measurements versus frequency response, and (3) measurements versus acceptable error. The breakdown of these measurement requirements are shown in diagrams. (Author)

## 7. ELECTRICAL EQUIPMENT

AD-259 088 Div. 7, 4
(6 July 61) OTS price $3.60

Radio Corp. of America, Somerville, N. J.
HIGH CAPACITY MAGNESIUM BATTERIES.
Quarterly progress rept. no. 3, 1 Dec 60-28 Feb 61,
by G. S. Lozier and R. J. Ryan. 28 Feb 61, 28p. incl. illus. tables.
(Contract DA 36-039-sc-85340, Proj. 3G-18-03-001)
Unclassified report

DESCRIPTORS: *Primary batteries, *Power supplies, *Dry cells, Magnesium, Magnesium compounds, Perchlorates Mercury compounds, Oxides, Manganese dioxide electrodes, Copper compounds, Electrolytes, Anodes (Electrolytic cells), Magnesium electrodes, Design, Cathodes (Electrolytic cell), Storage, Tests.

Further development of Mg/Mg (C104)2/HgO reserve cells is summarized. Optimum performance was obtained using a silver-plated, expanded copper cathode grid and mechanically blended cathode mix. The initial voltage discharge characteristic was improved by addition of AgO in the cathode mix. A comparison is given between the magnesium-cupric oxide and-mercuric oxide reserve cells. Mg anode efficiency data are presented for various alloys at 10 ma/sq cm as a function of temperature, and as a function of time off on intermittent service. Capacity, delayed action, and impedance shelf-life studies for Mg/Mg (C104)2/Mn02 and Mg/Mg (C104)2/CuO-AA size dry cells are summarized to 6 mo storage. (Author)

AD-259 160 Div. 7
(11 July 61) OTS price $1.10

Army Arctic Test Board, Fort Greely, Alaska.
EVALUATION OF IMPROVED BATTERY FILLER CAPS FOR USE WITH WINTERIZATION KIT FOR M48A2 TANK.
9 July 61, 4p. illus. (Proj. ATB 2-331)
Unclassified report

DESCRIPTORS: *Storage batteries, Arctic regions, *Tanks, Seals, Tests.

Service tests were made to determine the extent the improved battery filler caps corrected the battery heating system deficiency. The Improved Battery Filler Cap is a battery cell cover that provides an acid tight seal of the cell opening. It contains two vent openings that baffle the gases and prevents loss of electrolyte when splashed against the underside of the cap. The cap is threaded and contains a rubber gasket that seals between the top of the cell opening and the cap when the cap is screwed into the opening. It is fabricated from a hard rubber material capable of withstanding more heat than the standard cap. (Author)

AD-259 189 Div. 7
(11 July 61) OTS price $1.60

California U., Los Angeles.
DYNAMIC PROGRAMMING AND CONDITIONAL RESPONSE EXTRAPOLATION,
by Masanao Aoki. May 61, 16p. incl. illus.
18 refs. (Rept. no. 61-28)
(Contract Nonr-23352)
Unclassified report

DESCRIPTORS: *Programming, Control systems, Equations, Probability, Numerical analysis, Mathematical rediction, Partial differential equations, Computers, Digital systems, Statistical processes.

The concept of extrapolated conditional responses is discussed as it appears in the conventional as well as in the dynamic programming treatment of control systems. The concept is shown to play essential roles in both formulations. The technique of approximation in policy space is illustrated in the contex of a concrete example as one of the techniques thau may be utilized in reducing total computing time for solving functional equations of dynamic programming. (Author)

AD-259 226 Div. 7, 31, 26
(20 July 61) OTS price $2.60

Naval Submarine Base, New London, Conn.
GUIDE AND PROCEDURE TO ACCOMPLISH OVERHAUL OF SUBMARINE AUXILIARIES WITH THE OBJECTIVE TO REDUCE RADIATED NOISE AT ITS SOURCE,
by Robert York Chapman. 1 July 60, 26p. incl. illus. tables (Technical rept. no. 208-60)
(Proj. S-F013-1101)
Unclassified report

DESCRIPTORS: Submarines, *Submarine noise, Reduction, *Auxiliary power plants, Electric machinery, Electric motors, Generators, Maintenance, *Naval shops.

Contents:
The shop 54 story
Shop procedures for precision overhaul
  Test block and preoverhaul measurements
  Disassembly
  Inspection
  Installation and handling of bearings
  Balancing
  Reassembly
  Shop testing
  Post overhaul measurements
The noise and vibration shop recommended facilities
  The shop itself
  Special shop features to accomplish quality control
  Electronic instruments for machinery vibration and noise measurements
    Machinery facilities used by shop 54
    Power supply requirements
    Basic hand tool minimum requirements
Training of military personnel

AD-259 653 Div. 7
(17 July 61) OTS price $2.60

Eagle-Picher Research Labs., Joplin, Mo.
RESEARCH INVESTIGATIONS LEADING TO THE DEVELOPMENT AND EVALUATION OF A CADMIUM - SILVER OXIDE BATTERY HAVING A HERMETICALLY SEALED CONSTRUCTION.
Quarterly progress rept. no. 3, 1 Jan-31 Mar 61, by J. K. Wilson. 31 Mar 61, 23p. incl. illus. tables.
(Contract DA 36-039-sc-85370, Proj. 3G18-03-001-02)
Unclassified report

DESCRIPTORS: *Storage batteries, *Battery separators, Seals, Alkaline cells, Cadmium, Cadmium compounds, Silver compounds, Oxides, Electrolytes, Design, Recombination reactions, Electrodes.

Several types of regenerated separator materials have become available for test, and some appear promising. Preliminary capacity tests indicate a longer cycle life for the present series of control cells than was obtained from the series of cells previously tested. Preliminary tests indicate that negative plate configurations are available that will increase the maximum allowable overcharge rate many times. The present design of cells is not suitable for long life operation at 165 F. (Author)

AD-259 675 Div. 7
(19 July 61) OTS price $1.60

Coast Guard, Washington, D. C.
TESTS OF A SOLAR POWERED AID TO NAVIGATION.
14 June 61, 14p. incl. illus. tables.
(Proj. J24-2/1-1-11)
Unclassified report

DESCRIPTORS: *Solar cells, Navigational lights, Tests, *Battery chargers.

This report describes the operational tests of a solar powered battery charger for a U. S. Coast Guard aid to navigation. The system tested consisted of four watertight modules of 80 Type 2-A Hoffman Cells designed for 6-volt application. The four modules were connected in a series-parallel array to sustain a 12-volt 1.35 ampere lamp load flashing on a one-tenth duty cycle. The tests demonstrated the ability of the system to carry typical aids to navigation loads through two successive winters at the Los Angeles, California, test site. (Author)

AD-259 875 Div. 7, 8, 15
(21 July 61) OTS price $5.60

Electronics Research Lab., U. of Calif. Berkeley.
TIME-VARYING NETWORKS, I,
by L. A. Zadeh, 31 May 61, 55p. (Series no. 60, Issue no. 360)
(Sponsored by National Science Foundation)
Unclassified report

Presented at the Symposium on Time-Varying Networks, IRE Convention, April 24, 1961, New York, N. Y.

DESCRIPTORS: *Electrical networks, Control systems, Mathematical analysis, Differential equations, Operators (Mathematics), Matrix algebra, Integral equations, Functions, Statistical processes, Integral transforms.

This paper is not purported to be an exhaustive survey. Rather, its limited aim is to present a connected and not too superficial account of some of the significant and lesser known contributions to time-varying network theory made during the past ten years. Because of limitations on space, the paper is in two parts. Part I deals with the problem of transition from one mode of characterization to another, the so-called factorization problem, and with randomly varying systems. (Author)

AD-259 880 Div. 7, 14, 8
(21 July 61) OTS price $11.00

General Electric Co., Schenectady, N. Y.
RESEARCH ON THERMIONIC CONVERTERS.
Final rept. for Mar 59-Mar 61 on Thermal Energy Conversion Research.
June 61, 145p. incl. illus. tables, 80 refs.
(Contract AF 19(604)5472, Proj. 6692)
AFCRL-430) Unclassified report

DESCRIPTORS: *Thermionic emission, Space charges, Electrons, Generators, Electricity, *Power supplies, Plasma physics, Vacuum systems, Vapors, Electric fields, Magnetic fields, Ceramic materials, Materials, Cesium, Cathodes, Anodes, Single crystals, Scientific research, Gas Ionization, Heat engines, Electric power production, Tests, Tantalum.

Thermionic conversion involves the generation of electricity from thermal energy utilizing the phenomenon of thermionic emission of electrons, and requires no moving parts. Three basically different types of converters were the subjects of wide study: (1) vacuum converters which have now been developed to the product design stage for cathode temperatures in the range of 1100 to 1150 C, anode temperatures 600 to 700 C and electrical power outputs of 0.2 watt/ sq cm (min.) at an efficiency of 2.5%; (2) vapor converters which have been are developed for solar space power with an efficiency of 15% at a cathode temperature of 1800 C; and (3) crossed-field converters which utilize a combination of electric and magnetic fields to direct the electron flow from cathode to anode in the converter. This particular line of development did not appear to be fruitful, and further work was not recommended on the crossed-field approach. (Author)

# Division 7 - ELECTRICAL EQUIPMENT

AD-259 988 Div. 7
(24 July 61) OTS price $2.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
PERIMETER PANEL HEATING FOR POLAR BUILDINGS.
Final rept.,
by J. M. Stephenson. 12 July 61, 26p. incl.
illus. tables (Technical rept. no. 154)
Unclassified report

DESCRIPTORS: *Heating, Heating elements, *Buildings, Arctic regions, *Radiant heating panels, Design, *Prefabricated buildings, *Heaters, Tests, Effectiveness.

In polar buildings the problem of keeping the body comfortable is aggravated by cold walls and air stratification which results in excessive body radiation losses and overheated air. To determine whether panel heating could outperform the more conventional methods, an experiment was set up to test four radiant panels and compare their performance with finned-tube baseboard heaters. The design criteria for the prefabricated T-5 building was used in designing a 4-foot by 8-foot by 2-1/2-foot test box in which one 4 x 8 wall served as a removable test panel. Three of the test panels and the baseboard heater used hot water and one panel used hot air. The test box was placed in the NCEL cold chamber and the panels and baseboard heaters were each tested with an ambient temperature of -65 Fahrenheit. Conditions most conducive to comfort were obtained with an aluminum-faced ceiling panel. Cost estimates indicate that a suitable panel system of heating for the T-5 building is slightly more expensive and somewhat heavier than the baseboard system, but it is concluded that the benefits from panel heating are worth the additional expense. It is recommended that a panel system be installed in polar buildings to evaluate its performance under actual conditions. (Author)

# 8. ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-259 059 Div. 8
(6 July 61) OTS price $5.60

Electron Tube Research Lab., U. of Minn., Minneapolis.
STUDIES ON BASE NICKELS FOR OXIDE-COATED CATHODES.
Scientific rept. no. 11, 15 Oct 60-15 Jan 61, by W. G. Shepherd and D. E. Anderson. 15 Jan 61, 51p. incl. illus. tables.
(Contract AF 19(604)3890)
(AFCRL-349) Unclassified report

DESCRIPTORS: *Oxide cathodes, *Cathodes (Electron tubes), Reduction, Thermionic emission, Alloys, Coatings, Ceramic coatings, Thickness, Heating, Hydrogen, Gases, Surfaces, Anodes (Electron tubes), Nickel alloys, Aluminum alloys, Titanium, High temperature research, Thermodynamics.

Studies of the relationship between chemical reduction and thermionic activity of an oxide cathode were continued. Results are presented for oxide cathodes based on carbon-Ni diffusion throttles. It is postulated that a process involving a surface transport path can account for the observed behavior. Further studies are reported of the controlled reduction of an oxide cathode, applying a carbon source in a separate vacuum enclosure to the back face of the cathode base. The steady-state pulse emission appears to be proportional to the square root of the steady-state reduction rate. Cathodes, based on 0.2% and 0.08% Al-Ni alloys, have now operated at 1093 K for about 16,500 hr. Space-charge limited currents in excess of 11 amps/sq cm continue to be observed in all cases. The influence of the coating thickness on cathode properties was investigated. Both the saturation emission and coating conductivity increase monotonically with coating thickness over this range. The effects of heated anodes on oxide cathodes, photoelectric measurements of oxide coatings and thin films, and an analysis of the expected thermal transients in an oxide coating underlong-pulse current drain are also reported. (Author)

AD-259 081 Div. 8
(5 July 61) OTS price $4.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
CIRCULAR APERTURE EFFECTS IN A FOCUSSED MICROWAVE SYSTEM.
Rept. on the Study of Electromagnetic Radiation, by Thomas Harry Lewis. 15 May 61, 42p. incl. illus. 19 refs. (Rept. no. 1083-7)
(Contract AF 33(616)7081)
Unclassified report

DESCRIPTORS: *Microwaves, *Focusing, Lobing, Antennas, Microwave equipment, Antenna radiation patterns, Propagation, *Electromagnetic waves, Electromagnetic fields, Tests, Klystrons, Waveguides, Crystal detectors, Electromagnetic lenses, *Electron optics, *Optics, Diffraction, Lenses, Electron diffraction analysis, Parabolic antennas.

The effects of the far-field pattern produced by the insertion of circular apertures at the focus of a microwave system were investigated. Apertures of various diameters were used at several focal distances. Apertures larger than the first few diffraction rings of the image produced negligible changes in the main lobe of the far-field pattern. (Author)

AD-259 106 Div. 8, 7
(5 July 61) OTS price $5.60

Texas Instruments, Inc., Dallas.
PELTIER COOLING OF SEMICONDUCTOR COMPONENTS.
Final technical rept. 1 June 60-15 June 61, by Bob Carey and Raymond Marlow. 15 June 61, 1v. incl. illus. tables, 24 refs.
(Contract NObsr-81204)
Unclassified report

DESCRIPTORS: *Semiconductors, *Cooling, *Transistors, High frequency, Silicon, Thermoelectricity, Design.

The status of Peltier cooling as applied to semiconductor components is described. Five Peltier cooler-semiconductor component devices were designed, constructed, and evaluated. One of these devices is capable of maintaining the case temperature of two high frequency silicon transistors at 35 C while each transistor is dissipating 150 milliwatts and operating at an ambient temperature of 85 C. Recommendations for further study include miniaturization of the Peltier cooler, lower current coolers, and development of Peltier coolers located inside the transistor case. (Author)

AD-259 114 Div. 8
(6 July 61) OTS price $1.10

Westinghouse Electric Corp., Elmira, N. Y.
HIGH TEMPERATURE PHOTOELECTRIC TECHNIQUES AND MATERIALS.
Quarterly rept. no. 8, 16 Feb-15 May 61, by H. Shabanowitz and V. J. Santilli. 21 June 61, 10p. incl. illus. tables.
(Contract NObsr-77556)
Unclassified report

DESCRIPTORS: *Photoelectric materials, *Phototubes, Ionoscopes, *Photomultipliers, *Photoelectric cells, *Cathodes (Electron tubes), Camera tubes, Electron tubes, Processing, Manufacturing methods, High temperature research, Temperature, Sensitivity, Alkali metals, Antimony, Photoemission, Stability, Design.

Photocathodes continued to be processed in dummy photomultiplier structures. Approximately 50% of these had sensitivities in the range of 16 to 45 ua/l. Some thermodynamic calculations were made regarding the rates of arrival of the different metals as used in processing these bi-alkali photocathodes. The first bi-alkali (Na-K-Sb) photomultiplier experimental tube was made and tested. With a photocathode sensitivity of approximately 30 ua/l and six multiplying stages, over-all gains of 2780 and 1100 at 1200 and 1000 volts, respectively, between photocathode and anode, were attained. Further data was taken on later bi-alkali photocathodes under varying conditions of photocathode current loading and temperature. The greatest cause of photoresponse decay was due to a temperature rise rather than continuous current loading. (Author)

# Division 8 - ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-259 125 Div. 8
(7 July 61) OTS price $3.60

Clevite Corp., Cleveland, Ohio.
CERAMIC I-F TRANSFORMERS.
Quarterly rept. no. 3, 1 Dec 60-28 Feb 61, by D. R. Curran and D. J. Koneval. 31 Mar 61, 29p. incl. illus. tables (Rept. no. 18)
(Contract DA 36-039-sc-85346, Proj. 3G26-07-001-03)
Unclassified report

DESCRIPTORS: *Band-pass filters, *Radio-frequency filters, Ceramic materials, *Intermediate, frequency transformers, Piezoelectric materials, *Miniature electronic equipment, Reliability, Tests, Vibration, Polarization, Packaging, Electrodes, Mathematical analysis, Partial differential equations, Resonance.

Vibration tests were run on 4.3 mc resonators packaged in the micro-module configuration without adverse effects. Fabrication and packaging techniques were improved for 4.3 mc 1st overtone radial resonators. However, dimensional tolerances such as the thickness of the bond between micro-module wafers, appear to be critical. Packaging data is presented for a group of resonators. Equations of motion were solved for the asymmetrically excited radial vibrations of disks. The eigenfrequencies for these modes along with those of the previously identified symmetrical modes account for most spurious or unwanted responses in small diameter thickness resonant disks. In the development of uni-wafer filters, it was demonstrated that dot-resonators can be interconnected without adversely affecting their performance. Polarization requirements for the dot-resonator in terms of a range of action are discussed along with the effect of electrode thickness. (Author)

AD-259 140 Div. 8
(7 July 61) OTS price $1.60

North Carolina U., Chapel Hill.
A CONSTANT CURRENT MICROCOULOMETRIC TECHNIQUE FOR DROPPING MERCURY ELECTRODES,
by Harry B. Mark, Jr., Ellis M. Smith, and Charles N. Reilley. 27 May 61, 23p. incl. illus. tables, 22 refs. (Rept. no. UNC-Chem. no. 9-CNR)
(Contract AF 49(638)333)
(AFOSR-788) Unclassified report

DESCRIPTORS: *Polarographic analysis, Electrodes, Chemical reactions, *Mercury electrodes, Electrolysis, Electrolytes, Electrons, Test methods, Tests, Theory.

A constant current microcoulometric method for determining the number of electrons involved in a unit of reaction at a dropping mercury electrode is described in detail. A large capacitor is connected in parallel with the microcell, and a constant current applied to the combination. The results obtained from several tests with both reversible and irreversible reductions are discussed, and the optimum conditions for accurate results with the method are presented. The principal advantage of the amperostatic method over the usual potentiostatic method is the ease with which the number of coulombs passed during the electrolysis can be calculated. (Author)

AD-259 155 Div. 8
(7 July 61) OTS price $2.60

Electronics Research Labs., Columbia U., N. Y.
DISTORTION OF FM SIGNALS IN TRANSMISSION OR RECEPTION.
by C. P. Walsh. 1 Mar 61, 17p. incl. illus.
(Technical rept. no. T-3/164; Rept. no. CU-4-61)
(Contract AF 30(602)2233)
(RADC TN 61-72) Unclassified report

DESCRIPTORS: *Radio signals, *Radio transmission, Frequency modulation, Distortion, *Radio reception, *Antennas, Mathematical analysis, Sources.

The requirements for distortionless transmission of FM signals by planar antennas are deduced. The pattern of illumination must by symmetrical in amplitude and conjugate in phase about some point, called the antenna center. The distribution of the illumination pattern may vary in any manner with frequency, provided that at each frequency the symmetry requirements are met. The phase of the illumination at the antenna center is constrained to be either constant or, at most, linear with frequency. The majority of physical antennas possess the required properties by virtue of their geometrical symmetry. (Author)

AD-259 157 Div. 8, 6, 12
(6 July 61) OTS price $2.60

Stanford Research Inst., Menlo Park, Calif.
TRANSMISSION THROUGH AN IONIZED MEDIUM IN THE PRESENCE OF A STRONG MAGNETIC FIELD.
by H. Rothman and T. Morita. May 61, 20p. incl. illus. (Technical rept. no. 74)
(Contract AF 19(604)3458)
(AFCRL-337) Unclassified report

DESCRIPTORS: *Plasma physics, *Re-entry vehicles, *Magnetic fields, Radio waves, *Wave transmission, *Slot antennas, Antennas, Propagation, *Electromagnetic waves, Ultra high frequency, Telemeter systems, Polarization, Attenuation, Tests, Test equipment, Electromagnetic theory, Mathematical analysis, Guided missiles, *Atmosphere entry, Surface to surface.

The effects of a UHF telemetry signal propagating through the ionized region was investigated. The effects of applying a strong local magnetic field to transmission of radio waves through a highly conductive plasma close to the surface of a slot antenna in a ground plane are described. To obtain enhancement of transmission, a particular relationship must exist among the collision frequency of the plasma, the electron gyrofrequency of the magnetic field, and the impressed angular frequency. This relationship is discussed. Data showing the amplitude levels of the orthogonal components of the radiated field in the afterglow region of a pulse RF discharge indicate that magneto-ionic enhancement was achieved. In addition to this enhancement, the magnetic field exerts a pressure on the plasma which causes it to bloom within the confines of the magnetic field lines. Consequences of this perturbation on the propagation are discussed. (Author)

AD-259 196 Div. 8, 15
(10 July 61) OTS price $11.50

Columbia U. School of Engineering, New York.
THE USE OF A CLASS OF NONLINEAR SYSTEMS IN THE PROBLEM OF OPTIMUM FILTERING,
by Frank Fu-Chin Tung. 1 May 61, 153p. incl. illus. 68 refs. (Technical rept. no. 66, Rept. no. CU-13-61-AF-4140-EE)
(Contract AF 19(604)4140)
(AFCRL-341) Unclassified report

DESCRIPTORS: *Information theory, *Communications theory, *Electric fibers, *Nonlinear systems, Statistical functions, Statistical processes, Least squares method, Integral equations, Correlation techniques, Mathematical prediction, Digital systems.

The input and output of a class N(1) system are related by an integral whose kernel is a function of 2 variables. The 2 variables are the amplitude of the input and the elasped time since the input isapplied. Only stationary inputs are considered. Three aspects of the problems are considered. The first concerns the design of optimum filters for given inputs. Integral equations relating the form of the optimum filter and the statistics of the inputs are derived. A method is developed for the solution of the resulting optimizing integral equations; it includes a sufficient condition under which the solution so obtained corresponds to an optimum system which satisfies the conventional stability condition. The second part takes an unconventional approach to the problem of optimum filtering. It is concerned with the search for a class of message processes for a given noise and a prescribed filter such that the given filter is the optimum least square filter. The last aspect deals with a study of correlation functions. Some properties of the cross-correlation function between the outputs of a pair of class N(1) systems are investigated. In addition, consideration is given, to the problem of identifying an unknown class N(1). It is shown that the power density spectrum of the response of this unknown system to correlated Gaussian test inputs completely specifies the system. (Author)

AD-259 197 Div. 8, 15
(10 July 61) OTS price $3.60

Columbia U. School of Engineering, New York.
UNCERTAINTY RELATIONS FOR SAMPLED SIGNALS,
by Christopher Kaiteris. 15 May 61, 28p. incl. illus. (Technical rept. no. 67; Rept. no. CU-15-61-Nonr-266(60)-EE)
(Contract Nonr-26660, Proj. NR 049-134)
Unclassified report

DESCRIPTORS: *Communications theory, *Radio signals, Time signals, Electromagnetic theory, Sampling, Integral transforms, Spectrographic analysis, Theory, Differential equations, Frequency modulation.

The uncertainty principle for time signals, as defined by Gabor and others, has only been applied to continuous signals and the results cannot be readily extended to sampled signals. An uncertainty product is defined for sampled data signals and an inequality is derived for this product. The class of optimum signals for which the inequality becomes an equality is derived and two examples of non-optimum signals are discussed. (Author)

AD-259 198 Div. 8, 6
(10 July 61) OTS price $4.60

Electronic Defense Labs., Mountain View, Calif.
A BROADBAND AUTOMATIC TRACKING ANTENNA OF NOVEL DESIGN,
by James J. Epis. 27 Feb 61, 40p. incl. illus. tables (Technical memo. no. EDL-M348)
(Contract DA 36-039-sc-87475)
Unclassified report

DESCRIPTORS: Antennas, *Parabolic antennas, Radar antennas, Broadband, Automatic, *Radar scanning, *Radar tracking, Polarization, Diversity systems, Design, Nutating antennas, Antenna radiation patterns, Lobing, Standing wave ratios, Tracking, *Electronic scanners, S band, Radar interception, Reflectors, Impedance, Tests, Errors, Antenna horns.

Design and performance characteristics are presented for a new-type conical scanner which features the following important advantages: (1) broadband operation compared to other automatic tracking antennas, (2) a simple facility permitting very rapid change of antenna polarization, and (3) a comparatively simple mechanical design. This conical scanner design, originally developed for passive tracking radars, possesses possibilities for dual-operation as a combined target-polarization and target-position automatic tracker. This relatively advanced passive radar application and adaptation for active radars are considered. Several advantages and one expected disadvantage relative to conventional conical scanners are discussed. (Author)

AD-259 249 Div. 8, 5
(11 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
METHOD OF GANGING A MULTICHANNEL COMMUNICATION SYSTEM WITH TIME-DIVISION MULTIPLEX WITH A SYSTEM OF FREQUENCY-DIVISION MULTIPLEXING OF CHANNELS AND ARRANGEMENT FOR THE REALIZATION OF THE METHOD (Sposob Sopryazheniya Mnogokanal'noy Sistemy Svyazi S Vremennym Uplotneniyem S Sistemoy S Chastotnim Uplotneniyem Kanalov I Ustroystvo Dlya Osushchestvleniya Sposoba), by L. A. Korobkov. 2 May 61, 1p. (Trans. no. MCL-892 of Byulleten' Izobreteniy 11, pp. 25, 1960).
Unclassified report

DESCRIPTORS: *Communication systems, *Multiplex transmission, Frequency dividers, USSR, Technological intelligence.

AD-259 298 Div. 8, 30
(10 July 61) OTS price $4.60

HRB-Singer, Inc., State College, Pa.
EVALUATION OF A HEMISPHERICAL ANECHOIC CHAMBER, by E. H. Wintermute and R. E. Wolfe. 24 April 61, 41p. incl. illus. tables, 13 refs. (Rept. no. 252.1-F)
(Contract AF 30(602)2288)
(RADC TR 61-126)
Unclassified report

DESCRIPTORS: *Anechoic chambers, Hemispherical shells, *Antennas, Test equipment, Model tests, Electromagnetic wave reflections, Microwaves, *Antenna radiation patterns, Measurement, Tests, Shielding, Lobing, Absorption, Test methods.

An investigation was conducted to study the merits of a hemispherical anechoic chamber 150 ft in diameter, by making measurements on a model scaled by a factor of 1/12. This model was evaluated by a comparison of antenna patterns made within the chamber to patterns made on an outdoor test range. It was determined that the hemispherical geometry possesses unique difficulties which result in a performance of relatively low caliber. Other subjects related to this problem are also discussed, such as shielding, Fresnel and Fraunhofer regions, microwave absorption, and reciprocity within the chamber. (Author)

# Division 8 - ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-259 309 Div. 8, 25
(19 July 61) OTS price $9.10

Institute of Tech., U. of Minn., Minneapolis.
STUDY OF NOISE IN SEMICONDUCTORS AND SEMICONDUCTOR DEVICES.
Rept. no. 3, 1 Jan-31 Mar 61,
by K. M. van Vliet. 31 Mar 61, 91p. incl. illus. tables.
(Contract DA 36-039-sc-85374)
Unclassified report

DESCRIPTORS: *Semiconductors, *Noise (Radio), Measurement, Germanium, *Transistors, *Diodes, Direct current, Tellurium, Theory, Manganese, Intermediate frequency amplifiers, Infrared radiation, Tests, Electronic circuits.

Study was continued on noise in semiconductors and semiconductor devices. Noise measurements of the impact ionization process were continued. Noise measurements are described for manganese-doped germanium under infrared irradiation. New measurements are reported on tellurium, which are in agreement with the previous ones. Tunnel diodes were further investigated for various types. Noise measurements of transistors at liquid nitrogen temperature were extended to 10 mc. Measured values of Ieq are presented and show good agreement with theoretical values of Ieq at higher frequencies. A theoretical study is made on the operation of the tunnel diode mixer in cascade with an intermediate-frequency amplifier. For the tunnel diode mixer with short-circuited output a noise theory is presented and the noise figure is minimized by varying the signal conductance. In the minimum noise case, the conditions for gain and positive output conductance are derived. The total noise figure of the tunnel diode mixer and the intermediate-frequency amplifier is calculated in an example given at one of the possible optimum operating conditions. (Author)

AD-259 333 Div. 8, 14, 26
(11 July 61) OTS price $5.60

Electronic Systems Lab., Mass. Inst. of Tech., Cambridge.
A METHOD FOR FABRICATING THIN FERROELECTRIC FILMS OF BARIUM TITANATE.
by John P. Green, Jr. Apr 61, 46p. incl. illus. 28 refs. (Technical memo no. TM-105)
(Contracts AF 33(616)5489 and AF 33(616)7700, Projs. 7848 and 8690)
Unclassified report

DESCRIPTORS: *Ferroelectric materials, *Dielectrics, *Barium compounds, *Titanates, *Thin films, Dielectric properties, Electrical properties, Modulators, Amplifiers, Capacitors, Production, Manufacturing methods, Quality control, *Dielectric films, Vacuum apparatus.

A new method of generating thin (2 microns) ferroelectric films of BaTiO3 was developed. The process consists essentially of the deposition in a vacuum of alternate layers of BaO and TiO2 onto a platinum substrate, followed by a heat treatment in air to react these compounds to form BaTiO3. An electrode can then be applied on top of the film to form a ferroelectric capacitor. the technique has resulted in films which contain a significant amount of BaTiO3 and which exhibit the characteristic hysteresis in the charge-voltage relation of a ferroelectric material. However, there is a lack of quantitative agreement between the measured film parameters and the generally accepted bulk values. (Author)

AD-259 366 Div. 8
(11 July 61) OTS price $1.60

Rutgers U., Coll. of Engineering, New Brunswick, N. J.
STUDY OF SLOW-WAVE STRUCTURES.
Final technical rept. 1 July 60-31 Jan 61,
by J. F. Dienst. 31 Jan 61, 14p. incl. illus.
(Rept. no. ML002-0171F2)
(Contract DA 36-039-sc-85332)
Unclassified report

DESCRIPTORS: *Traveling wave tubes, Electron tubes, Circuits, Microwave equipment, Tuning devices, *Waveguides, Propagation, Ferrites, Ferromagnetic materials, Magnetic fields, Perturbation theory, Radiofrequency filters, Microwaves.

An attempt was made to investigate the propagation characteristics of a disk-loaded circular waveguide periodically loaded with a ferrite material. Introduction of dispersive materials such as ferrites into a periodic structure alters the characteristic of the structure. In the case of ferrites it should be possible to change the location of the stop bands by varying the magnetic bias field in the ferrite. Perturbation theory indicates that this is true through the dependence of the effective permeability of the ferrite on the biasing magnetic field. (Author)

AD-259 370 Div. 8, 26
(10 July 61) OTS price $5.60

Sperry Electronic Tube Div., Sperry Rand Corp., Gainesville, Fla.
MANUFACTURE OF PULSED TRAVELING WAVE TUBES.
Final rept. 29 Apr-30 Nov 60.
May 61, 47p. incl. illus. (Pub no. NJ 4105-0045)
(Contract DA 36-039-sc-78334)
Unclassified report

DESCRIPTORS: *Traveling wave tubes, Electron tubes, *Manufacturing methods, Microwave equipment, Ultra high frequency, Production, Design, Tests, Solenoids, *Radiofrequency generators, Radiofrequency power, *Power amplifiers, *Microwave amplifiers, Amplifiers.

The program objective was to provide a chain of traveling wave tube amplifiers for use in the 300 to 600 mc frequency range. Six STP-256 and STP-108 traveling wave tubes and one STP-108 focusing solenoid were designed and manufactured. The STP-256, developing one watt RF power, is capable of driving the STP-108 which develops 200 watts minimum peak power output in the 300 to 600 mc frequency range. A pilot line capable of producing 20 high power and 30 low power tubes per month was established. (Author)

AD-259 371 Div. 8, 5, 1, 12
(10 July 61) OTS price $1.60

Stanford Research Inst., Menlo Park, Calif.
RADIATION AND RECEPTION OF ELECTROMAGNETIC ENERGY FROM AIRCRAFT AND GUIDED MISSILES,
Final rept. Apr 58-Apr 61. by J. E. Nanevicz.
Apr 61, 15p.
(Contract AF 19(604)3458)
AFCRL-338) Unclassified report

DESCRIPTORS: *Electromagnetic effects, Aircraft, Guided missiles, *Airplane antennas, *Antennas, *Bibliography, Precipitation static, Design, Static electricity, High

frequency, Airborne, Communication equipment, *Radio communication systems, *Electromagnetic waves, Rocket motors, Scattering.

Investigations are presented in the following areas; studies of specific antenna types, experimental studies, theoretical studies, and studies related to antenna systems. The relationship of these investigations to other work at Stanford Research Institute and to the aircraft antenna development program of the Air Force is briefly discussed. (Author)

AD-259 376 Div. 8, 25
(11 July 61) OTS price $9.10

Texas Instruments, Inc., Dallas.
SILICON SEMICONDUCTOR SOLID CIRCUITS.
Interim technical engineering rept. for 12 Oct 60-31 Mar 61, by Jay W. Lathrop, William Brower, and Harvey Cragon. May 61, 91p. incl. illus. tables.
(Contract AF 33(600)42210, Proj. 7-865)
(ASD IR 7-865, vol. 1) Unclassified report

DESCRIPTORS: *Semiconductors, Silicon, *Diodes, *Transistors, Solid state physics, Manufacturing methods, Phosphorus, Boron, Anhydrides, Chlorides, Borates, Oxides, Methyl radicals, Capacitors, Thin films, Evaporation, Electrical properties, Measurement, Printed circuits, Digital computers, Electronic circuits, Cleaning, Diffusion, Photoengraving, Test sets, Packaging, Design, Subminiature electronic equipment, Trigger circuits.

Process techniques required for the fabrication of semiconductor networks are being established. Studies of silicon slice preparation, diffusion, contact formation, film dielectrics and test structures are discussed. Equipment assembly techniques for a serial, digital computer are investigated. (Author)

AD-259 388 Div. 8
(11 July 61) OTS price $1.60

Westinghouse Electric Corp., Elmira, N. Y.
HIGH TEMPERATURE MATCH-BOX ELECTRON TUBES.
Quarterly progress rept. no. 1, on phase 2, for 1 Feb-30 Apr 61,
by Joel H. Fink. 30 Apr 61, 15p. incl. illus.
(Rept. no. 7)
(Contract DA 36-039-sc-87404, continuation of Contract DA 36-039-sc-75076)
Unclassified report

DESCRIPTORS: *Electron tubes, High temperature research, Design, *Glass, Nucleation, Materials, *Triodes, Cathodes (Electron tubes), Tungsten, Nickel, Glass seals, Structures, Ceramic materials, Tests.

Efforts are devoted to the development of a pyroceram match-box receiving tube capable of operating in an ambient temperature of 500 C for a minimum of 1000 hours. Materials and techniques were investigated to be used in the construction of a line of such high temperature tubes. The first objective was to develop a technique for assembling this tube, using only the envelope and seal area for supporting the tube elements. Temporary tools and fixtures were made for the evaluation of several methods for holding the grid and cathode. Only preliminary tests have been conducted so far, and no final decision as to the best approach has been made to date. (Author)

AD-259 408 Div. 8
(12 July 61) OTS price $1.10

Pneumafil Corp., Charlotte, N. C.
INVESTIGATION OF THERMAL DESIGN FOR STANDARD ELECTRONIC ASSEMBLIES.
Letter rept.,
by James B. Smith. June 61, 3p.
(Contract NObsr-81377)
Unclassified report

DESCRIPTORS: *Electronic equipment, Design, Tests, *Cooling, *Distributed amplifiers, *Transistors, Air cooled, Servo amplifiers, Heat transfer.

AD-259 465 Div. 8, 2
(13 July 61) OTS price $1.10

Radio Observatory, Calif. Inst. of Tech., Owens Valley, Calif.
THE BRIGHTNESS DISTRIBUTION IN EXTRAGALACTIC RADIO SOURCES.
by A. T. Moffet and P. Maltby. 1961, 3p. incl. tables.
Unclassified report

DESCRIPTORS: *Radio waves, *Extraterrestrial radio waves, Sources, Brightness, *Radio astronomy, Radio interferometers, Measurement, Distribution, Parabolic antennas, Radio transmission.

Efforts are presented on a continuing program of angular size and brightness distribution measurements. One hundred eighty radio sources were observed with the variable spacing interferometer at the Owens Valley Radio Observatory. Results are presented for a group of 88 sources which were observed with both an east-west and a north-south baseline. All observations were made at a wavelength of 31.3 cm. (Author)

AD-259 470 Div. 8
(14 July 61) OTS price $6.60

General Electric Co., Syracuse, N. Y.
AIR WEAPONS CONTROL SYSTEM 412L.
Quarterly reliability program rept. no. 1. 31 Mar 61, 74p. incl. tables (Rept. no. AWCS-SQR-1)
(Contract AF 30(635)10117)
Unclassified report

DESCRIPTORS: *Air control centers, *Ground controlled interception systems, *Aircraft intercept control systems, Electronic equipment, Tests, Reliability, Ground support equipment, Data processing systems, Radar equipment, Communication equipment, Standards, Failure (Mechanics), Numerical methods and procedures, Life expectancy.

Reliability efforts are presented on Air Weapons Control System 412L. These efforts are presented in the following areas: (1) systems reliability analysis, (2) component applications and standards, (3) reliability measurements, (4) design audit, (5) subcontractor reliability status, (6) reliability education, (7) production reliability, and (8) human factors.

# Division 8 - ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-259 479 Div. 8
(14 July 61) OTS price $2.60

Lincoln Lab., Mass. Inst. of Tech., Cambridge.
AFC FOR DISCRETE FREQUENCIES,
by Thomas J. Rey. 19 May 61, 15p. illus. (Rept. no. 476-0023)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: *Backward wave oscillators, Stabilization, Microwave frequency, S band, Automatic, Control, Design, Delay lines, Broadband, *Microwave oscillators, Hysteresis, Reduction, Tests, Discriminators, *Radio-frequency oscillators, Oscillators, *Frequency stabilizers, Theory, Phase detectors.

An AFC (automatic frequency control) was developed for stabilizing the frequency of a voltage-tunable oscillator near any one of many discrete frequencies. A delay line takes the place of the conventional cavity in the discriminator. The discrete steps correspond to the electrical length of the delay line, e. g. 2 mcs at S-band in the system. Slow frequency fluctuations inherent in the oscillator are reduced; a stabilization factor of 100 was achieved in a system for jumping frequency rapidly by stepping the tuning voltage. The nature of the hysteresis loops and means for their reduction are discussed. The subject is significant for improving the stability and the spectrum of wide-band tunable oscillators. (Author)

AD-259 488 Div. 8
(13 July 61) OTS price $4.60

Microwave Associates, Inc., Burlington, Mass.
REFINEMENT PROGRAM ON ELECTRON TUBE S-BAND TR EST-27.
Quarterly progress rept. no. 4, 1 Feb-30 Apr 61, by Robert Tenenholtz. 30 Apr 61, 1v. incl. illus. tables.
(Contract DA 36-039-sc-85316)
Unclassified report

DESCRIPTORS: S band, *Transmit receive tubes, Electron tubes, Tuning devices, Radiofrequency filters, *Radar duplexers, Microwave equipment, Design, Materials, Tests, Iron compounds, Yttrium compounds, Garnet, *Cavity resonators, Tuned circuits.

Final design was completed on the improved mechanically-tunable EST-27 S-band TR tube. A qualitative investigation was conducted on varactor tuned cavities after little improvement was secured over previously reported performance. Results showed this approach to be impractical with respect to required bandwidth, tuning range and insertion loss specifications. On the basis of this, work was then concentrated on further development of the tunable YIG filter. An insertion loss of less than 1 db was secured over the desired frequency range (2.7 - 2.9 kmc). Data with respect to low level operation and limiting capabilities are presented. (Author)

AD-259 495 Div. 8
(13 July 61) OTS price $15.50

Molded Insulation Co., Philadelphia, Pa.
ULTRA-MINIATURE PRINTED CIRCUIT CONNECTORS.
Final rept. 1 Sep 58-30 Nov 59,
by Frederic D. Mitchell. 30 Nov 59, 225p. incl. illus. tables.
(Contract DA 36-039-sc-78006, Proj. 3-26-00-700)
Unclassified report

DESCRIPTORS: *Subminiature electronic equipment, *Printed circuits, *Electronic circuits, *Electric connectors, Specifications, Plugs (Electricity), Electric terminals, Production, Design, Manufacturing methods, Reliability, Tests, Transistors.

Results are presented of an intensive program leading to the development, production and complete evaluation of ultra-miniature connectors for use with single sided printed circuit boards. Basic design requirements are discussed together with the integration of this development with the Micro-Module Program. Designs are given for the right-angled and straight-through or parallel type connectors. Evaluation test data is included along with production analysis and manufacturing data. Reliability and quality assurance data was developed and appropriate specifications are included together with supporting data. Suggestions are made as to possible future investigations in the area of ultra-miniature connectors for use with multi-layer printed circuit boards. (Author)

AD-259 503 Div. 8, 30
(24 July 61) OTS price $2.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
AC AND IMPULSE SWITCHING TECHNIQUES FOR USE WITH MAGNETIC MEMORIES,
by Robert E. McMahon. 26 June 61, 22p. incl. illus. (Rept. no. 312G-0006)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: *Alternating current, *Magnetic cores, *Magnetic core switches, *Memory devices, *Switching circuits, Data storage systems, Coding, Speech, Electronic circuits, Signal-to-noise ratio, Electron transitions.

The application of a HF ac drive current to cores that have been partially switched by an impulse current was used in extending the previously developed model of switching. The ac drive combined with impulse switching also provides additional techniques for use in magnetic circuit designs. (Author)

AD-259 522 Div. 8, 12
(13 July 61) OTS price $22.25

Assistant Secretary of Defense (Research and Engineering), Washington, D. C.
SHOCK, VIBRATION AND ASSOCIATED ENVIRONMENTS. PART IV.
June 61, 411p. incl. illus. tables (Bulletin no. 29, pt. 4)
Unclassified report

The 29th Symposium on Shock, Vibration and Associated Environments held at U. S. Naval Supply Center, Oakland, Calif., Nov 15-17, 1960.

DESCRIPTORS: *Symposia, Shock, Vibration, Tests, *Electronic equipment, Test methods, *Guided missiles, Launching, Acoustics, Design, Harmonic analysis, Vibration isolators, Test equipment, *Piezoelectric transducers, Analysis.

Papers are given which were presented at a symposium on shock, vibration, and associated environments. These papers concern test methods and techniques, data analysis, design, and acoustic environments. Also included are the proceedings of the panel session on the establishment of test levels from field data, and the session on zero shift in piezoelectric transducers. (Author)

AD-259 538 Div. 8
(14 July 61) OTS price $3.60

Stanford Electronics Labs., Stanford U., Calif.
BIRTH, LIFE, AND DEATH IN MICROELECTRONIC SYSTEMS,
by B. Widrow, W. H. Pierce, and J. B. Angell,
30 May 61, 33p. incl. illus. 18 refs. (Technical rept. no. 1552-2/1851-1)
(Contracts AF 33(616)7726 and Nonr-22524, Proj. NR 373 360)
Unclassified report

DESCRIPTORS: *Subminiature electronic equipment, Reliability, Life expectancy, *Quality control, Digital systems, Statistical processes, Probability, Mathematical logic, Resistors, Memory devices, Mathematical prediction, Electronic circuits, *Variable resistors, *Electronic equipment, Maintenance, Electrical networks.

An adaptive vote-taker is proposed which compares the outputs of paralleled redundant system parts in a binary system and determines the most probable answer based on past performance of the separate parts. Initially, the vote-taker assigns equal significance to each redundant part, and (in a binary system) requires that a simple majority of the parts be correct. With experience, the vote-taker continually reduces the weight (significance) of the outputs from those parts that make mistakes, thereby gradually eliminating the defective parts. Thus, the vote-takers (which may also be paralleled if they are unreliable) act as automatic repairmen which delete defective parts of a system. System dependability and life expectancy can be made to exceed the dependability and average life expectancy of the component parts. The heart of an adaptive vote-taker is an element providing variable gain with memory. A variable resistor with memory (memistor) which uses electrochemical depostion or removal of copper to achieve the variable memory was successfully applied to this function. (Author)

AD-259 541 Div. 8, 25
(14 July 61) OTS price $2.60

Stanford Electronics Labs., Stanford U., Calif.
ON THE SCATTERING OF ELECTROMAGNETIC WAVES BY NONISOTROPIC INHOMOGENEITIES IN THE ATMOSPHERE,
by D. T. Gjessing. 10 May 61, 21p. incl. illus. 13 refs. (Technical rept. no. 770-3)
(Contract DA 36-039-sc-78296)
Unclassified report

DESCRIPTORS: *Ionospheric propagation, Scattering, *Electromagnetic wave reflections, Turbulence, *Radio communication systems, Integral transforms, Electromagnetic waves, Propagation, Mathematical analysis.

The scattering of radio waves by a nonisotropic permittivity field is discussed. The problem is generalized to nonisotropic atmospheric conditions with axes of symmetry which are neither vertical nor horizontal. Working in Fourier space, a simple expression for the scattering cross-section is derived. On the basis of this discussion, some of the experimental anomalies experienced can be explained. (Author)

AD-259 542 Div. 8
(12 July 61) OTS price $3.60

Sperry Microwave Electronics Co., Clearwater, Fla.
DEVELOPMENT OF C-BAND BEACON FERRITE DUPLEXER.
Quarterly progress rept. no. 3, 1 Jan-31 Mar 61,
by J. Clark, May 61, 31p. incl. illus. 14 refs.
(Rept. no. SJ-220-0029-3)
(Contract DA 36-039-sc-85330)
Unclassified report

DESCRIPTORS: *Miniature electronic equipment, C band, *Radar duplexers, Limiters, Transmission lines, Electric connectors, Microwave eqipment, Design, *Radar beacons, Ferrites.

Results obtained with the gyromagnetic coupling limiter indicated that this device will operate satisfactorily with low loss and with only a change in the magnitude of the biasing field required for tuning. A combination of three components - the gyromagnetic coupling limiter, a high power four port circulator, and a high power coaxial load - was chosen as the most suitable configuration for the C-band beacon duplexer. Configuration including a coaxial subsidiary resonance limiter and a minaturized strip transmission line isolator discarded because of the relatively high insertion loss that existed in these components. Careful study was given to the high power problem and it was concluded that the modified type N connector may yield exceptional high power performance. (Author)

AD-259 545 Div. 8, 25
(14 July 61) OTS price $3.60

Stanford Research Inst., Menlo Park, Calif.
DESIGN AND CONSTRUCTION OF APPARATUS FOR ELECTRON SCATTERING MEASUREMENTS.
Final rept.,
by Donald C. Lorents and Charles J. Cook,
22 June 61, 26p. incl. illus. 12 refs.
(Contract AF 19(604)3475)
(AFCRL-631)
Unclassified report

DESCRIPTORS: *Electrons, *Scattering, Electron accelerators, *Molecular beams, *Electron beams, Ion accelerators, *Ion beams, Electron capture, Oxygen, Nitrogen, Elastic scattering, Test equipment, Design, Measurement, *Laboratory equipment, Vacuum systems, Construction.

Two types of beam-beam interaction experiments were considered in detail. (1) A powerful method of studying low energy 2-body reactions by means of the superposition of 2 intense reactant beams of low relative velocity was conceived and investigated. The mathematical problem of data reduction was found to be tractable. The experimental techniques and apparatus required for the study of ion-atom interchange reactions were considered to be feasible. (2) The important class of interactions involving the scattering of low-energy electrons from transitory atomic systems was also considered. A crossed beam experiment for the determination of absolute differential cross sections for scattering of slow electrons was examined in detail. Feasible techniques of noise reduction were evolved, and the necessary equipment to measure elastic scattering by atomic oxygen and nitrogen was found to be completely within present technical capability. An apparatus was designed for the measurement of absolute elastic and inelastic differential scattering cross sections at electron energies ranging from a few tenths of an ev to several hundred ev. Moreover, the apparatus was designed to accept target species provided not only by fast beams but also by thermal beams and static gases. (Author)

# Division 8 - ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-259 547 Div. 8, 26, 25
(14 July 61) OTS price $4.60

Stanford Research Inst., Menlo Park, Calif.
APPLICATION OF ELECTRON-BEAM MACHINING TECHNIQUES TO SEMICONDUCTORS.
Final rept.,
by K. R. Shoulders and D. W. Peters. Apr 61,
34p. incl. illus. tables, 22 refs.
(Contract AF 19(604)6114)
(AFCRL-329) Unclassified report

DESCRIPTORS: *Semiconductors, *Machining, *Electron beams, Silicon, Films, Electron lenses, *Electron optics, Electron guns, Electron microscopes, Manufacturing methods, Crystals, Vacuum systems, Molecular beams, Photoengraving, Subminiature electronic equipment, *Thin films, Tests.

A silicon film 200 Angstrom units thick was machined by an electron-beam-activated machining process to a resolution of 1000 Angstrom units by using commercial electron-optical and high-vacuum apparatus. This process uses an electron beam to produce a chemically resistant layer of silica on the surface of silicon. The unprotected silicon is removed by a molecular beam-etching process in a high-vacuum chamber, thus forming a pattern of silicon that conforms to the shape of the electron beam. A design was completed for a scanning electron microscope which should give a resolution of greater than 200 Angstrom units. The electrostatic lens system is being constructed of metallized ceramic, so that high mechanical stability can be obtained through repeated ultrahigh-vacuum bake-out cycles. Electron gun parts and lens elements were constructed and tested in operation, and found to agree with the design values, although the entire lens system has not been tested as a unit. Upon successful completion of the electron-optical system and accessory equipment, it is expected that this method of micromachining of semiconductors can be applied to the fabrication of useful microelectronic semiconductor devices. (Author)

AD-259 616 Div. 8
(17 July 61) OTS price $1.10

Aerospace Technical Intelligence Center,
Wright-Patterson Air Force Base, Ohio.
A SLOT ANTENNA WITH ELLIPTICAL POLARIZATION ON A ROUND WAVEGUIDE IN THE RECEPTION REGIME,
by Yu. V. Shubarin and T. N. Anishchenko.
26 May 61, 5p. incl. illus. (Trans. no. MCL-1085 of Radiotekhnika i Elektronika 5:2057-2059, 1960)
Unclassified report

DESCRIPTORS: USSR, Technological intelligence, *Slot antennas, Antennas, *Waveguides, Waveguide slots, Polarization, Phase shifters, Test methods, Bessel functions, Tests, Mathematical analysis, Wave analysis, Electromagnetic waves.

A waveguide-slot emitter with rotary polarization on a round waveguide in the wave reception regime with linear polarization was investigated. It was concluded that it is possible to use the emitter as a polarization, making it possible to convert the linearly polarized field into a field of any polarization (within the frequency range), and as a polarimeter. (Author)

AD-259 626 Div. 8, 5, 25
(17 July 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
RADIO (SELECTED ARTICLES).
14 June 61, 21p. (Trans. no. MCL-963 of Radio 1:pp. 11-14, 15-17, 1961)
Unclassified report

DESCRIPTORS: Technological intelligence, *Radio stations, USSR, *Electrons, Scattering, Photons, Diffraction, Particle accelerators, Radio equipment, *Radio communication systems, Nucleons, Quantum mechanics, Nuclear spins, Electron microscopes, *Telephone communication systems, *Radiotelephones.

Contents:
The inexhaustible electron
Radio station NEDRA-1

AD-259 630 Div. 8, 25
(17 July 61) OTS price $2.25

Radio Corp. of America, Princeton, N. J.
ELECTROLUMINESCENCE IN OPTICAL AMPLIFIERS.
Final rept. for 1 Mar 58-30 Nov 59 on Research on the Quantum Nature of Light,
by F. H. Nicoll, A. Sussman, and, H. B. Devore.
Dec 59, 82p. incl. illus.
(Contract AF 33(616)5509, Proj. 7072)
(WADD TR 60-147; Supersedes AD-236 295)
Unclassified report

Original contains color plates; all ASTIA reproductions will be black and white. Original may be seen in ASTIA Hq.

DESCRIPTORS: Luminescence, *Luminescent materials, Solid state physics, Optics, Light, *Amplifiers, Photoelectric effect, Cadmium compounds, Sulfides, Selenium, Phosphors, *Image intensifiers (Electronics), Photoconductivity.

Work done in two broad areas is summarized. The first is work directed specifically towards the fabrication of a prototype light amplifier having a two-color input and a two-color output; the second is work on materials which might eventually be of value in light amplifiers. The work which leads directly to the two-color light amplifier is described along with that work which was rejected for the final prototype. The final method, using two photoconductors on the input, is covered in more detail. A full description of the construction of a 6 x 6-in. panel is given and the exact formulation of the various layers appears in the Appendix. Results are given for the two prototype panels to be delivered under the contract and the means of testing and demonstrating the panels is described. A section of the report is devoted to a description of the mounting and testing equipment for these panels. The second area of work covered in the report is on materials. This includes measurements on cadmium sulfide and cadmium selenide photoconductive powders. (Author)

AD-259 643 Div. 8, 26
(17 July 61) OTS price $6.60

Centre de Physique, Electronique et Corpusculaire (France).
RESEARCH ON 8 MILLIMETER M-TYPE CARCINOTRON TUBES.
Status rept. no. 4,
Apr 61, 54p. incl. illus. (Rept. no. NR 655)
(Contract AF 61(052)413)
(RADC TN 61-135) Unclassified report

DESCRIPTORS: France, *Backward-wave oscillators, Electron tubes, Design, Tests, Microwave equipment, Production, Magnetic fields, Machining, Cathodes (Electron tubes), Waveguide windows, Anodes (Electron tubes).

Three circular tubes were built and tested. The tuning range of the third tube extended up to 43,500 mc with a few watts and delivered 15 watts at 40,000 mc. The efficiency was only about 3% and a substantial amount of current was apparently lost directly from the cathode to the pole pieces. Tests of hobbing and propagation were continued. The building of 2 linear tubes neared completion. The packaged circular tube might weigh as low as 11 lbs. (Author)

AD-259 647 Div. 8
(17 July 61) OTS price $1.60

General Dynamics/Convair, San Diego, Calif.
ELECTRICAL AND ENVIRONMENTAL TEST OF MATERIALS USED ON THE PENCIL BEAM REFLECTOR OF THE REINS ANTENNA,
by James R. Taber. July 61, 13p. (Rept. no. ZN-524)
Unclassified report

DESCRIPTORS: Materials, *Antennas, Electrical properties, Absorption, Reflectors, Dielectric properties, Water, *Expanded plastics, Glass textiles, Epoxy resins, Urethanes, Polymers, Tests, Test methods, Physical properties, Measurement.

Tests were conducted to determine the amount of water absorption and its effect on the electrical properties (the dielectric constant and loss tangent) of the materials presently used on and the materials proposed for the pencil beam reflector of the Reins antenna. The 3 types of materials tested were designated as types A, B and C. Type A material was NOPCO Lockfoam A-603 with fire retardant added. One layer of 0.004 inch thick fiberglass was bonded to 2 parallel surfaces with Epocast #2 epoxy resin. These 2 surfaces represent the front and back surfaces of the Reins pencil beam reflector. Type B samples were the same as type A except the bonding agent was polyurethane resin. Type C sample was the same as type B except that only one surface representing the outer surface of the pencil beam reflector was covered. All of the samples were sealed on all surfaces with their respective resins. The results of the tests were that the type A samples exhibited a 2.0% change in dielectric constant while types B and C exhibited 0.8% and 0.3% change, respectively. The % change in the weight of these samples was 2.6% for type A, 0.8% for type B, and 0.3% for type C. The percent change in thickness was 2.2% for type A, 1.6% for type B and 1.4% for type C. The loss tangent measurements are also presented. (Author)

AD-259 649 Div. 8, 5, 30
(17 July 61) OTS price $4.60

General Dynamics/Convair, San Diego, Calif.
PROPOSAL LONG DISTANCE VHF COMMUNICATION AIRBORNE ANTENNA ARRAY.
July 61, 39p. incl. illus. tables (Rept. no. ZN-523)
(Sponsored by the Federal Aviation Agency)
Unclassified report

DESCRIPTORS: Antennas, *Airplane antennas, Airborne, Very high frequency, *Radio communication systems, Antenna radiation patterns, Design, Tests, Commercial planes, Test facilities, *Communication equipment.

A proposal for an airborne, VHF, long distance communications antenna array is presented with its development and supporting program for testing. The design may be easily applied to various aircraft types with a minimum effort and cost and makes maximum use of existing components and proven techniques in the simplest manner possible to insure that the final product will give maximum reliable performance. Preliminary functional testing facilities are described. (Author)

AD-259 650 Div. 8
(17 July 61) OTS price $1.60

Cruft Lab., Harvard U., Cambridge, Mass.
THE TRANSIENT RESPONSE OF LINEAR ANTENNAS AND LOOPS,
by Ronold W. P. King and H. J. Schmitt.
30 Mar 61, 14p. illus. (Technical rept. no. 338)
(Contract Nonr-186632)
Unclassified report

DESCRIPTORS: *Transients, Antennas, *Dipole antennas, *Loop antennas, Impedance, Fourier analysis, Pulse analyzers, Transmission lines, Reflection, Mathematical analysis, Theory.

The transient response of straight wires and circular loops when short pulses are applied is studied experimentally and theoretically. It is shown that the initial response is always that of an infinitely long antenna at a frequency near the upper limit of the frequencies contained in the pulse provided this is sufficiently short so that the first reflection from the end of the wire or loop is not superimposed on it. (Author)

AD-259 660 Div. 8, 6
(17 July 61) OTS price $8.60

General Electric Co., Syracuse, N. Y.
SYNTHETIC APERTURE ANTENNA INVESTIGATION.
Final rept.
by W. B. Adams and B. R. Mayo. Apr 61, 91p.
incl. illus. tables, 47 refs.
(Contract AF 30(602)2323, Proj. 4506)
(RADC TR 61-101) Unclassified report

DESCRIPTORS: *Radar antennas, Antennas, Linear systems, Mathematical analysis, Broadband, Radar signals, Synthesis, Nonlinear systems, Doppler radar, Waveform generators, Radar targets, Correlation techniques, Functions, Data processing systems, Detection, Coding, *Radar equipment.

A general mathematical model of a linear radar system is developed. In this model the antenna is treated as a two-port filter whose transfer function contains the spatial angles as parameters. It is concluded that the transmit transfer function of an antenna differs from its receive transfer function. The relationships connecting the two were developed. The mathematical model allows the calculation of the radar system performance for arbitrary transmit waveforms and arbitrary antenna transfer functions. The time-domain and frequency-domain impulse responses of the uniformly-illuminated continuous aperture, the cosine-tapered continuous aperture, the electric dipole, the magnetic dipole, and the three-dimensional array of elements are developed. The spatial configuration of an array which has the same one-way transfer function as the two-way transfer function of a given array is shown to be given by the convolution of the spatial configuration of the given array with itself. The

mathematical model is used to calculate the pattern of a uniform aperture excited by a simple pulse which is short compared to array length. The pattern is shown to be normal in the region near boresight but radically different from the normal pattern for angles far off boresight. The pattern for a phase steered array excited by a simple pulse which is short compared to array length is also calculated. (Author)

AD-259 670 Div. 8
(17 July 61) OTS price $1.60

Electron Tube Research Lab., U. of Minn., Minneapolis.
NOISE MEASUREMENTS AS A TOOL IN ELECTRON DEVICE RESEARCH.
Quarterly progress rept. no. 5, 1 Jan-31 Mar 61, by A. van der Ziel. 31 Mar 61, 18p. incl. illus. (Contract DA 36-039-sc-85289)
Unclassified report

DESCRIPTORS: *Electron tubes, *Cathodes (Electron tubes), *Noise (Radio), Coatings, *Iconoscopes, *Microwave amplifiers, Measurement, Electronic circuits, Mathematical analysis, Design, Low frequency, *Image tubes, Test methods, Test equipment, Amplifiers, Oxide cathodes, Electronic equipment, Tests.

The methods of measurements used for both the Seebeck noise studies and the image orthicon noise studies are discussed. The results of preliminary measurements of the noise of the beam current of an image orthicon are presented. The spectrum appears to be white and of the magnitude expected for full shot noise above 300 c. Problems affecting the accuracy of the experiments on image orthicon noise are investigated. (Author)

AD-259 700 Div. 8, 14, 20
(17 July 61) OTS price $2.60

Stevens Inst. of Tech., Hoboken, N. J.
UNCLASSIFIED LITERATURE SURVEY ON EFFECTS OF NUCLEAR RADIATION TO ELECTRON-TUBE MATERIALS.
Quarterly rept. no. 2, 1 Feb-30 Apr 61, by E. R. Johnson. 30 Apr 61, 19p. (Rept. no. 5735-2)
(Contract DA 36-039-sc-87382, Proj. 3A99-13-001-01) Unclassified report

DESCRIPTORS: *Electron tubes, *Radiation damage, *Thin films, Metals, Ceramic materials Semiconductors, Glass, Neutron bombardment, Cyclotrons, Symposia, Gases, Materials, Literature, Glass seals.

Papers presented at a conference on radiation effects on inorganic solids held at the Centre D'Etude Nucleaire, Paris, France, Apr. 1961, under the auspices of the Faraday Society are listed. Much of the material pertained to radiation effects on metals, semiconductors and ceramics. The advantages of thin films as radiation damage resistant material are discussed and literature references cited. Principal effects of static radiation damage other than bulb fractures are: large changes in plate current; erratic behavior of cathode current; open filaments; changes in grid currents; gassiness.

AD-259 708 Div. 8
(18 July 61) OTS price $2.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
FREQUENCY STABILITY OF AN OSCILLATING SOLID-STATE MASER,
by H. H. Plotkin and R. Bridgham. Apr 61, 28p. incl. illus. (ASRDL Technical rept. no. 2192)
Unclassified report

DESCRIPTORS: *Microwave amplifiers, S band, Frequency stabilizers, Amplifiers, *Microwave oscillators, Oscillation, Phase measurement, Stability, Design, Tests, Radiofrequency spectrum analyzers, *Radiofrequency oscillations, Oscillators.

The major sources of frequency fluctuations in the output of a self-oscillating solid-state maser were found to be variations in the microwave pumping power and in the level of the helium liquid gas interface. A 3-level maser was constructed with X-band pump frequency and S-band, signal frequency. The output frequency near 2770 mc varied by 100 kc when the X-band power varied by 9 db. In runs extending over several hours, a periodic fluctuation of frequency was observed, arising from standing waves at the helium liquid surface. Decreasing the coupling of cavity to waveguide reduced the periodic component amplitude from 50 kc to 3 kc. At the same time, random rapid fluctuations were reduced from 50 to 4 C. (Author)

AD-259 709 Div. 8
(18 July 61) OTS price $6.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
AMMONIA RESEARCH AND MASER DEVELOPMENT,
by F. O. Vonbun, H. H. Plotkin, and G. A. White. Dec 60, 63p. incl. illus. (ASRDL Technical rept. no. 2172)
Unclassified report

DESCRIPTORS: *Microwave amplifiers, Ammonia, Amplifiers, Vacuum systems, Molecular beams, Focusing, Microwave oscillators, Design, Tests, Cavity resonators, Frequency stabilizers, Airborne, Guided missiles, Frequency, Standards.

An attempt was made to develop a maser with useful military applications. To achieve this purpose, experiments and measurements were carried out on a twin cavity ammonia beam maser. Work was done on a sealed-off vacuum system, on the design of molecular guns and focuser and state separator. Consideration was also given to the design of cavities, detection systems and power measurements. (Author)

AD-259 720 Div. 8, 20, 25
(18 July 61) OTS price $4.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
EFFECTS OF ADSORBED MOLECULES AND GAMMA RADIATION ON THE SURFACE PROPERTIES OF GERMANIUM DIODES.
Master's thesis,
by David Mariano Verrelli. Mar 61, 50p. incl. illus. 16 refs. (Rept. no. GNE/Phys/61-20)
Unclassified report

DESCRIPTORS: *Radiation damage, Gamma rays, Surface properties, Germanium, *Diodes, Electrical properties, Semiconductors, Ozone,

Adsorption, Molecules, Oxygen, Water vapor, Theory, Tests, Electron transitions, Conductivity.

The reverse current-voltage characteristics of a germanium grown junction are measured both before and during CO-60 gamma irradiation of 5.65 x 10 to the 7th power ergs/gm C-hour. The ambients are dry oxygen, ozone, and water vapor. For a dry oxygen ambient in radiation, the current rises with increase in voltage until, at a critical value of the voltage, the current drops sharply. No such drop is observed in ozone or water vapor. A theoretical interpretation whereby oxygen molecules are desorbed from the surface is offered to account for the sharp drop. The magnitude of the current below the critical voltage is attributed to an excess surface charge resulting from the transfer of electrons across the oxide barrier. (Author)

AD-259 769 Div. 8, 6
(19 July 61) OTS price $3.60

Applied Physics Lab., Johns Hopkins U., Silver Spring, Md.
CRITERIA FOR CONICALLY SCANNED TRACKING ANTENNAS,
by T. C. Cheston. Feb 61, 32p. incl. illus.
(Rept. no. CM-992)
(Contract NOrd-7386)
Unclassified report

DESCRIPTORS: Antennas, *Radar antennas, Radar equipment, *Nutating antennas, Tracking, *Radar tracking, *Antenna radiation patterns, Lobing, Amplitude modulation, Phase shifters, Measurement, Mathematical analysis.

Criteria for conical-scan type tracking antennas are analyzed in a generalized way, with particular reference to cross-over gain, modulation sensitivity and radiation pattern. The analysis covers amplitude and phase comparison methods. It is shown that the radiation patterns of interest are not, as generally believed, the individual static patterns, but their RF vector sum and difference. A method of measuring these sum and difference patterns is suggested. (Author)

AD-259 772 Div. 8, 5
(27 July 61) OTS price $5.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
DESIGN PROBLEMS IN PULSE TRANSMISSION.
Doctoral thesis,
by Donald Winston Tufts. 28 July 60, 48p. 24 refs.
(Technical rept. no. 368)
(Contract DA 36-039-sc-78108)
Unclassified report

DESCRIPTORS: *Pulse communication systems, *Pulse transmitters, Digital systems, Waveform generators, Pulse modulation, *Communication theory, Radio signals, Detectors, Fourier analysis, Calculus of variations, *Information theory.

Criteria for determining optimum pulse shapes for use in a synchronous pulse transmission link are proposed and compared. Formulas for the optimum pulses are presented, and calculations are carried through in examples. In a secondary problem, we present methods for calculating optimum interpolatory pulses for use in reconstructing a random waveform from uniformly spaced samples. The case of a finite number of samples and the case of an infinite number of samples are disucssed. A mean-square criterion is used to judge the approximation. The results provide a generalization of the sampling principle. (Author)

AD-259 786 Div. 8, 15
(18 July 61) OTS price $6.60

Remington Rand Univac Div., Sperry Rand Corp., Philadelphia, Pa.
MATHEMATICAL CIRCUIT ANALYSIS AND DESIGN,
by Albert BROWN, L. Robin Hulls, and others.
Mar 61, 67p. incl. illus. tables (Scientific rept. no. 2)
(Contract AF 19(604)5189)
(AFCRL-191)
Unclassified report

DESCRIPTORS: *Electronic circuits, *Inverter circuits, Design, Transistors, Diodes, Inequalities, Mathematical analysis, Statistical analysis, Numerical methods and procedures, Statistical distributions, Partial differential equations, Digital computers, Programming, Circuits, Relaxation oscillators.

Mathematical techniques are applied to the analysis of the steady-state performance of a transistor gate-inverter circuit. The statistical calculation of circuit behavior is discussed and results are presented for the computer analysis of a typical circuit. A detailed mathematical description of the technique for determining the maximum component tolerance is included and the subsequent statistical study indicates the importance of the maximum tolerance determination in circuit design. (Author)

AD-259 807 Div. 8
(19 July 61) OTS price $2.60

American Electronic Labs., Inc., Philadelphia, Pa.
DESIGN AND DEVELOPMENT OF ANTENNA GROUP AN/TLA-8 ( ).
Quarterly rept. no. 6, 1 Oct 59-28 Feb 61,
by I. Korsen and C. Cerva. 28 Feb 61, 26p. incl. illus. table (Technical rept. no. 58029-6)
(Contract DA 36-039-sc-78063)
Unclassified report

DESCRIPTORS: Antennas, Broadband, *Vehicle antennas, Antenna masts, *Dipole antennas, Very high frequency, Ultra high frequency, Design, Tests.

The design details are presented of the antenna group AN/TLA-8( ). Included are improved antenna matching techniques for the log periodic-dipole array with additional mechanical improvements in the antenna assembly, polarization position mechanism, mast, tripod and the friction drive erection assembly. (Author)

AD-259 809 Div. 8, 26
(19 July 61) OTS price $1.60

Bulova Research and Development Labs., Inc., Woodside, N. Y.
INDUSTRIAL PREPAREDNESS MEASURE ON TYPE CR-(XM-27)/U CRYSTAL UNITS.
Combined quarterly rept. no. 4, June-Dec 60,
by C. C. Spreckels. Dec 60, 13p. incl. tables.
(Contract DA 36-039-sc-81271)
Unclassified report

DESCRIPTORS: Crystals, Production, Manufacturing methods, Reliability, *Quartz crystals, Shock resistance, Vibration, Processing, *Crystal oscillators, Tests.

Research was continued on CR-(XM-27)/U crystal production. Two sets of Preproduction Samples were subjected to preproduction tests. The first

set failed these tests. In the second set of 30 preproduction sample crystal units, 10 crystal units at an operating frequency of 61mc were approved; because of test failures at 10mc and 30mc - primarily temperature test failures and cracked bead defects in the crystal bases - these frequencies were not approved. Additional preproduction samples, consisting of 10 crystal units each at frequencies 10mc and 30mc, were resubmitted for temperature run tests and cracked bead inspection. Since high frequency vibration and high shock test results on all 30 preproduction samples were satisfactory, these tests will not be repeated. (Author)

AD-259 811 Div. 8
(19 July 61) OTS price $1.60

Case Inst. of Tech., Cleveland, Ohio.
(No title).
Quarterly scientific progress rept. no. 23,
1 Jan-31 Mar 61.
31 Mar 61, 27p. incl. illus.
(Contract AF 19(604)3887)
(AFCRL-380) Unclassified report

DESCRIPTORS: *Electromagnetic waves, Diffraction, Ferrites, *Antennas, Design, *Dielectrics, Reflectors.

Progress is reported on work in the areas of artificial dielectrics with anisotropic properties, surface current measurements, and network synthesis. A polarization diversity lens considered made from a strip type artificial dielectric is discussed. Design equations for the surface contours of this lens are derived. Some theoretical results on probe-reflector interaction, in connection with surface current measurements, are given and discussed. In the network synthesis area an alternate method for arriving at the Bott-Duffin network is introduced. Also a new shorter proof to an extension of Richard's theorem is outlined. (Author)

AD-259 821 Div. 8, 25
(28 July 61) OTS price $2.60

Varo, Inc., Garland, Tex.
ION BEAM APPROACH TO MICROCIRCUITRY.
Final rept. on Phase 1, June 61.
June 61, 22p. incl. illus.
(Contract Nonr-316700)
Unclassified report

DESCRIPTORS: *Subminiature electronic equipment, *Electronic circuits, *Ion beams, Electron guns, Sources, Vacuum systems, Ions, Argon, Magnetic fields, Magnets, Plasma physics, Magnetohydrodynamics, Gas ionization, Deposits, Ion bombardment.

Research concerns the development of a technique for fabricating microminiaturized electronic circuits by deposition from a controlled ion beam. Such a technique would eliminate many of the problems of present methods using vapor deposition and masks to control the geometry. The present state of the art permits the essentially 2-dimensional deposition of resistive, conductive, dielectric and magnetic materials on suitable substrates. Metallic or photoresist masks are used to control the geometry of the deposited material. The proposed apparatus for ion beam deposition is shown schematically. An experimental ion source was built as a first step toward the development of a deposited circuitry system using a directed beam of ions. (Author)

AD-259 846 Div. 8
(20 July 61) OTS price $4.60

Microwave Devices Lab., U. of Utah, Salt Lake City.
MICROWAVE PROPAGATION IN A CIRCUIT CONSISTING OF FOUR COUPLED LADDERS,
by L. S. Bowman and R. W. Grow. 1 May 61, 35p. incl. illus. tables, 14 refs. (Technical rept. no. 1)
(Contract Nonr-128805, Proj. NR 373-740)
Unclassified report

DESCRIPTORS: *Microwave networks, *Microwaves, *Propagation, Electric fields, Magnetic fields, *Backward-wave oscillators, Electron beams, *Electronic circuits, Impedance, Electromagnetic fields, Equations, Fourier analysis, Series, Mathematical analysis, Waveguides, Phase shifters, *Oscillator circuits.

An analysis is presented of the propagation characteristics of multiple coupled slotted infinite planes or ladders. Such coupled ladder circuits may be useful in the millimeter wavelength region for backward-wave oscillators. From the solution of the field equations an equation describing the propagation characteristics is obtained and curves of frequency versus phase shift are presented for various arrays consisting of up to four ladder planes. (Author)

AD-259 847 Div. 8
(20 July 61) OTS price $3.60

Microwave Devices Lab., U. of Utah, Salt Lake City.
CERENKOV MICROWAVE RADIATION TO AN INFINITE DIELECTRIC MEDIUM,
by C. H. Durney and R. W. Grow. 1 May 61, 29p. incl. illus. (Technical rept. no. 2)
(Contract Nonr-128805, Proj. NR 373-740)
Unclassified report

DESCRIPTORS: *Cerenkov radiation, Microwaves, Dielectrics, Modulation, Electron beams, Space charges, Magnetohydrodynamics, Electromagnetic waves.

The Cerenkov radiation produced by a modulated beam of electrons passing through a hole in an infinite dielectric is calculated. The Cerenkov radiation is considered to be a microwave coupler for demodulating an electron beam. The analysis is carried out as a boundary-value problem with space-charge effects included and with the assumption that the electrons have no transverse velocity. The equation determining the propagation constant along the beam has not yet been solved because of its complexity, but it is shown that under certain conditions of Cerenkov radiation the propagation constant is complex, thus admitting the possibility of growing waves along the electron beam. (Author)

AD-259 848 Div. 8, 25
(20 July 61) OTS price $4.60

Microwave Devices Lab., U. of Utah, Salt Lake City.
AN INVESTIGATION OF MAGNETIC TRANSVERSE WAVES ON AN ELECTRON BEAM,
by C. C. Johnson. 8 May 61, 39p. incl. illus. (Technical rept. no. 3)
(Contract Nonr-128805, Proj. NR 373-740)
Unclassified report

DESCRIPTORS: *Electron beams, *Magnetic fields, Electromagnetic waves, Propagation, Traveling wave tubes, Helixes, Cyclotrons, Theory.

An electron beam in the presence of an axial magnetic field supports four transverse waves-two cyclotron waves and two synchronous waves. A general coupling theory is developed from an electronic equation and a circuit equation to describe how these waves can be coupled to traveling-wave circuits. The polarization and power flow characteristics of the waves are derived and substantitated by physical arguments. This theory is applied to the bifilar helix, a circuit which can couple selectively to each of the four modes. A bifilar helix traveling-wave tube was used to investigate experimentally these four beam modes and provide a quantitative check of the coupling theory. (Author)

AD-259 903 Div. 8, 2
(24 July 61) OTS price $2.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
A BROAD-BAND FREQUENCY MULTIPLIER AND MIXER FOR DISPERSIVE DOPPLER MEASUREMENTS,
by K. H. Patterson. Apr 61, 25p. incl. illus.
(BRL memo. rept. no. 1343)
(Proj. 503-06-011)
Unclassified report

DESCRIPTORS: *Frequency multipliers, Broadband, *Doppler systems, Sounding rockets, *Electronic circuits, Recording devices, Electromagnetic effects, Electrical properties, *Ionosphere, Automatic volume control, Tracking, Satellite vehicles, Tests, *Doppler tracking.

The use of dispersive doppler techniques, in studies of the ionosphere, has led to the development of a frequency multiplier and mixer. A broad-band frequency multiplier and mixer with sinusoidal output is described. For this particular device, the multiplication factor is 6 and the bandwidth exceeds one octave. The multiplier and mixer were used in tracking operations for the past several months. It has provided dispersive doppler data in quantities and types which have been unavailable in the past. The device, together with the Transit satellite and the necessary receiving equipment, is considered to be satisfactorily filling the need for large quantities of high quality data, well suited for use in obtaining more quantitative information on ionospheric properties. (Author)

AD-259 908 Div. 8
(24 July 61) OTS price $6.60

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
WIDE-BAND AMPLIFIERS USING FOUR-PORT ACTIVE DEVICES,
by J. J. Golembeski. 1 Feb 61, 63p. incl. illus.
(Technical rept. no. 62; Research rept. no. EE 489)
(Contract DA 36-039-sc-85272)
Unclassified report

DESCRIPTORS: Broadband, Amplifiers, *Electrical networks, Electronic circuits, *Distributed amplifiers, Admittance, Electron tubes, *Tetrodes, Electrodes, Measurement, Design, Tests.

A circuit model for the WX3683 tube was determined by experimental techniques. The tube is considered an active 4-port device and the driving-point admittance of each port was measured as a function of frequency with the other ports both open circuited and short circuited. These functions were realized to a good approximation by simple networks of passive elements at frequencies up to 550 mc. The model so obtained was analyzed further to optimize the bandwidth obtainable from a distributed amplifier made of such tubes. It was found that a capacitive termination of each port would considerably extend the cut-off frequency of the amplifier. The limitations of the model did not permit this optimization to be used in the design of an amplifier. A cut-off frequency of 600 mc was selected, with the knowledge that the model was valid at much lower frequencies, and of marginal accuracy over 550 mc. The amplifier was constructed and tested. The performance was satisfactory, for the theoretical gain was realized, and the cut-off frequency of the amplifier was 500 mc. (Author)

AD-259 909 Div. 8
(24 July 61) OTS price $4.60

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
A WIDE-BAND VOLTAGE VARIABLE AMPLIFIER,
by K. Ganapathy. 1 Apr 61, 43p. incl. illus.
(Technical rept. no. 63; Research rept. no. EE 490)
(Contract DA 36-039-sc-85272)
Unclassified report

DESCRIPTORS: *Amplifiers, *Voltage amplifiers, Broadband, Electrical networks, *Electronic circuits, Pentodes, *Electron tubes, Tests, Mathematical analysis, *Distributed amplifiers, Triodes.

Employing the principles of the paraphase amplifier, and differential amplifier, a network is designed to behave as a variable-polarity variable-gain wide-band amplifier. Complete analysis is given for the derivation of the screen voltage versus transconductance of pentodes from published data. Some of the possible applications of the network are described. An experimental amplifier was constructed and tested and the results are also discussed. (Author)

AD-259 946 Div. 8, 6
(24 July 61) OTS price $6.60

Electronic Defense Labs., Mountain View, Calif.
BACKWARD-WAVE OSCILLATOR NOISE POWER,
by E. D. Woodward. 25 Apr 61, 60p. incl. illus. tables (Technical memo. no. EDL-M349)
(Contracts DA 36-039-sc-85402 and DA 36-039-sc-87475)
Unclassified report

DESCRIPTORS: *Backward-wave oscillators, *Microwave oscillators, Oscillators, S band, X band, Measurement, Noise (Radar), Backward-wave amplifiers, Signal-to-noise ratio, *Noise (Radio), *Radio receivers, Radar receivers, Electron tubes, Test methods, Tests, Radio interception, Radar interception.

Measurements of the noise-power density spectra of several S-band and X-band backward-wave oscillators are described. Sufficient details of equipment and technique are presented to disclose some of the problems encountered when measuring power close to the background noise level. An unexpected result was the presence of intense peaks of noise power in the region 50 to 80 mc on either or both sides of the carrier frequency. A positive correlation was found between measured IF sideband noise power and receiver sensitivity. The results obtained are consistent with the model of the BWO as an oscillating backward-wave amplifier. (Author)

AD-259 954 Div. 8, 7
(24 July 61) OTS price $2.60

Air Force Cambridge Research Labs., Bedford, Mass.
SWITCHING DEVICES FOR VERY HIGH CURRENTS,
by E. H. Cullington and W. G. Chace. Apr 61, 23p. incl. illus. table (Instrumentation for Geophysics and Astrophysics no. 17; AFCRL-290)
(Proj. 8608)
Unclassified report

DESCRIPTORS: *Electric switches, Switches, *Vacuum switches, Electron tubes, *Electronic switches, Voltage, Electrodes, Trigger circuits, *Switching circuits, Copper electrodes, Design, Mounting brackets, Thyratrons.

Impulse switches designed to connect a power source to a load in a very short time (10 to the -7th power sec) and carry very large currents (1000 to 10 to the 8th power amps), but with no ability to interrupt the current once started, are discussed. The construction and operation of the concentric three-electrode or Lovotron type switch is described at length. The switch is shown to be useful for voltages from 1000 to 10 to the 6th power and for currents up to 10,000 amps. By paralleling units, the current-carrying ability can be extended without limit. Construction is simple and flexible. Copper is satisfactory for most installations. Sturdy mounting is necessary to withstand the stresses during discharge. Several trigger units are described. That of Theophanis is particularly recommended as being very effective, simple to construct, inexpensive, and easily adapted for multiple switching. (Author)

AD-259 972 Div. 8, 6, 5, 19
(21 July 61) OTS price $19.75

Jansky and Bailey, Inc., Washington, D. C.
PROPAGATION DATA FOR INTERFERENCE ANALYSIS. VOLUME II-2,
by Henry R. Reed. Jan 61, 299p. incl. illus., tables.
(Contract AF 30(602)1934)
(RADC TR 61-15B)
Unclassified report

DESCRIPTORS: *Radio interference, *Radio interference analyzers, *Radio communication systems, *Radio navigation, *Radar navigation, *Radar, *Radar interference, Propagation, *Electromagnetic waves, Diffraction, Atmospheric refraction, *Wave transmission, Mathematical analysis, *Ionospheric propagation, Digital computers, Statistical analysis, Mathematical prediction, Absorption, Atmosphere, *Radio waves, *Radio fields.

The information contained in this volume is an extension of AD-259 973 to produce a codification of methods useful in the computation of propagation characteristics for persons involved in interference prediction. Studies were continued and essentially completed on the modes of propagation which exist in homogeneous media. Certain cases of propagation in situations where non-homogeneous conditions prevail are reported. These studies are continuing together with those which are time dependent, that is, those which vary seasonally or over the period of a day. (Author)

AD-259 973 Div. 8, 6, 5, 19
(21 July 61) OTS price $26.00

Jansky and Bailey, Inc., Washington, D. C.
INTERFERENCE ANALYSIS STUDY. VOLUME I-2.
Jan 61, 473p. incl. illus. tables.
(Contract AF 30(602)1934)
(RADC TR 61-15A)
Unclassified report

DESCRIPTORS: *Radio interference, *Radio interference analyzers, *Radio communication systems, Interference, Mathematical prediction, *Radio navigation, Radiofrequency spectrum analyzers, Statistical analysis, Digital computers, Propagation, Antennas, Radio transmitters, Radio receivers, *Radar interference, Radar antennas, Radar receivers, Radar transmitters, *Radar navigation, Reliability, Signal-to-noise ratio, *Radar, Electromagnetic waves, Antenna radiation patterns, Analysis.

Results as presented of studies directed toward an analysis of the interference prediction problem. The development of a prediction technique is described in logical step-by-step sequence. The initial Rapid Cull Step gives a gross estimate of potential interference. Both time-dependent statistics and statistics which are fundamentally independent of time are applied to determine the probability of interference as a function of reliability. Application of results is stressed and examples are cited to show such treatment applied to transmitter spectral output, receiver response, antenna patterns, and propagation loss. A typical sample problem is described and solved. Methods of deriving the input functions for antennas, transmitters, receivers, and coupling systems are discussed. Antenna radiation characteristics are analyzed for 6 antenna classifications. Methods of dealing with antenna combinations, such as apertures and reflectors, are discussed. A method of prediction for the spectral output of transmitters was developed. A method of evaluating the receiver input function as a complex combination of RF selectivity, mixer response, and IF selectivity was developed. (Author)

# 9. FLUID MECHANICS

AD-259 050 Div. 9, 25
(6 July 61) OTS price $4.60

Fluid Dynamics Research Lab., Mass. Inst. of Tech., Cambridge.
EXPANSION AND DIFFUSION OF A LAYER OF HOT GAS IN THE PRESENCE OF THERMAL RADIATION,
by Chuen-Yen Chow. Mar 61, 41p. incl. illus. tables (Rept. no. 61-2)
(Contracts AF 19(604)5698 and AF 49(638)207)
(AFCRL-427) Unclassified report

DESCRIPTORS: Explosions, *Shock waves, *Compressible flow, *Gases, *Thermal radiation, Thermodynamics, Heat, Heat transfer, Numerical analysis, Mathematical analysis, Diffusion.

A radiating gas slab at very high temperature and moderate pressure expands and diffuses into the surrounding cold atmosphere. Under the assumption that the effect of adiabatic cooling is small compared to that of radiation cooling, and that the energy flux radiated from the interior of the gas slab is much greater than the influx, the equations of motion are solved to obtain the distributions of temperature, density, pressure, particle velocity and radiation flux inside the slab as functions of time and a space coordinate. The positions and velocities of the slab's bounding surface at different times are also obtained. The magnitude of the neglected adiabatic cooling term in the energy equation is then computed and compared with the radiation term, to show that it can be neglected. (Author)

AD-259 174 Div. 9, 15
(10 July 61) OTS price $1.60

Brown U. Div. of Applied Mathematics, Providence, R. I.
THE STABILITY OF VISCOUS FLOW BETWEEN ROTATING CYLINDERS IN THE PRESENCE OF A STRONG AXIAL MAGNETIC FIELD,
by W. H. Reid. June 61, 15p. (Scientific rept. no. 5)
(Contract AF 19(604)7236)
(AFCRL-635) Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, Fluids, Hydrodynamics, Magnetic fields, *Liquids, Mathematical analysis, Boundary layer, Viscosity, Stability.

The problem of the stability of viscous flow between rotating cylinders in the presence of an axial magnetic field is discussed within the framework of the small-gap approximation, i.e. it is assumed that d equals R2 -R1 and R2-R1 is very much smaller than 1/2(R1 + R2). The nature of the problem is shown to depend very markedly on whether the cylinders rotate in the same or in opposite directions, and the various approximations applicable to these two cases are discussed. Special attention is given to the limiting case of a strong field as omega-2/omega-1 approaches minus infinity. (Author)

AD-259 253 Div. 9
(11 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
INVESTIGATION OF THE VISCOSITY OF SOME LIQUIDS IN A WIDE RANGE OF TEMPERATURES,
by N. I. Kopylov. 26 Apr 61, 7p. incl. illus. table (Trans. no. MCL-870 of Inzhenuno-Fizicheskiy Zhurnal:pp. 97-101, 1960).
Unclassified report

DESCRIPTORS: *Liquids, *Alcohols, *Methanols, *Propanols, *Carbon tetrachloride, *Viscosity, *Hydrodynamics, Fluid flow, Mathematical analysis, Test methods, Test equipment, Tables, Theory, USSR, Temperature, Measurement.

The viscosity of methyl alcohol, H-propyl alcohol and carbon tetrachloride were experimentally measured up to temperatures of 238.8, 238.3 and 228.3 C, respectively. The method of liquid flow through a capillary was used; the viscosity was measured in a viscosimeter with circulation circuit and constant pressure. Tables of the viscosity values for the temperature range of 1 to 280 C are presented. (Author)

AD-259 255 Div. 9, 25
(11 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
NOTE ON PROBLEM OF HEAT EXCHANGE IN A PIPE AT HIGH RATES OF AIR MOTION,
by G. V. Tsiklauri and V. V. Usanov. 26 Apr 61, 6p. incl. illus. (Trans. no. MCL-868 of Inzhenuno-Fizicheskiy Zhurnal:pp. 48-51, Nov 60).
Unclassified report

DESCRIPTORS: *Pipes, *Heat transfer, Gases, Air, *Compressible flow, Hydrodynamics, Supersonic flow, Determination, Mathematical analysis, USSR.

AD-259 303 Div. 9
(20 July 61) OTS price $3.60

Hydronautics, Inc., Rockville, Md.
LINEARIZED THEORY FOR THIN, SUPERCAVITATING HYDROFOILS WITH SPOILER-FLAPS OPERATING AT HIGH SPEEDS BENEATH A FREE SURFACE,
by C. F. Chen. 9 June 61, 14p. illus. (Technical rept. no. 119-1)
(Contract NObs-84296)
Unclassified report

DESCRIPTORS: *Hydrofoils, *Hydrodynamics, Mathematical analysis, *Flaps, Lift, Drag, Pressure, Differential equations, Integral equations, Load distribution, Measurement.

The linearized problem of flow past a flat plate with a deflected upper flap is solved including the free surface effects. The flow is assumed to detach at the trailing edges of the flap and of the plate leaving an infinite cavity of constant pressure behind. The results are applicable to flaps of arbitrary length, hinged at arbitrary distance from the leading edge and at arbitrary depth. Numerical results are presented to show the effect of depth on the lift and drag coefficients of a trailing edge flap whose chord is 30% of the chord of the plate, the effect of the hinge position of such a flap on the hydrodynamic characteristics of a plate at infinite depth, and the pressure distribution on a flapped plate at infinite depth. The principal results obtained are: as the depth decreases, the flap becomes less effective and less efficient; as the hinge position is moved rearward, the flap becomes more effective and more efficient. (Author)

# Division 9 - FLUID MECHANICS

AD-259 320 Div. 9, 13
(11 July 61) OTS price $3.60

Massachusetts Inst. of Tech., Cambridge.
RANDOM VIBRATION OF A NONLINEAR SYSTEM WITH A SET-UP SPRING,
by Stephen H. Crandall. June 61, 30p. incl. illus. 20 refs.
(Contract AF 49(638)564)
(AFOSR-709) Unclassified report

DESCRIPTORS: Nonlinear systems, *Vibration, *Dynamics, Damping, Acceleration, Springs, Mathematical analysis, Equations, Partial differential equations, Failure (Mechanics), Motion, Probability, Functional analysis.

Several aspects of the problem of random vibration in nonlinear systems are discussed in terms of a particular set-up spring system. Exact solutions for the mean square response and the expected frequency of zero crossings are obtained by means of the Fokker-Planck equation. These are compared with approximate solutions obtained from equivalent linearization techniques. The distribution of response peaks is then studied and a probability density is derived for the peaks on a relative frequency basis. The probability density of the response envelope is also obtained and the relationship between the two distributions is discussed. (Author)

AD-259 379 Div. 9, 31, 2
(11 July 61) OTS price $8.60

Texas A. and M. Coll, College Station.
CHARACTERISTICS OF DEEP-SEA ANCHOR CABLES IN STRONG OCEAN CURRENTS,
by Basil W. Wilson. Feb 61, 81p. incl. illus. tables (Technical rept. no. 204-3; Ref. no. 61-1T)
(Contract Nonr-211902)
Unclassified report

DESCRIPTORS: *Ships, Mooring, Ocean currents, Cable assemblies, *Anchors, *Hydrodynamics, Fluid flow, Drag, Mathematical analysis, Theory, Integration.

This analysis examines the steady state configuration of a deep-sea mooring cable in realistic ocean currents in a nominal water depth of 12,000 ft. The earlier solutions of the problem of a cable in a uniform current are adapted to variable distributions of velocity by the artifice of considering the ocean as a series of laminae within each of which the current can be regarded as uniform. The calculation procedure is developed for stepwise numerical integrations, and computations were made for a wide range of sizes of steel-wire and nylon rope mooring lines under two conditions of severe ocean currents, involving 6 and 3 knot velocities at the surface. Influences of the current are taken to vanish at a depth below the surface of 1000 m (3280 ft). Justifications for the choice of design currents are given. Results of the calculations are available in a series of figures and tables. Several examples of the use of the tables are given in solution of mooring problems. (Author)

AD-259 455 Div. 9
(14 July 61) OTS price $7.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
HYPERSONIC FLOW-BLAST ANALOGY,
by J. Lukasiewicz. June 61, 76p. incl. illus. tables, 17 refs. (Rept. no. AEDC TR 61-4)
(Contract AF 40(600)800, Proj. 8952)
Unclassified report

DESCRIPTORS: *Hypersonics, Aerodynamics, Pressure, Shock waves, Mathematical analysis, Differential equations, *Axially symmetric flow, *Aerodynamic configurations, *Hypersonic flow, Load distribution, Blast.

Two-dimensional and axisymmetric, inviscid, hypersonic flows about simple slender bodies are considered with particular reference to pressure distributions and shapes of shock waves. Approximate solutions, based on blast analogy, are derived and compared with more exact, theoretical calculations and with experimental results. The validity of correlation parameters predicted by the blast analogy and the range of their applicability are investigated. Near-exact theoretical results available for real airflow at Mach numbers from 15 to 19 are compared with the perfect gas data. (Author)

AD-259 475 Div. 9
(14 July 61) OTS price $7.60

Hydronautics, Inc., Rockville, Md.
THE STATIC STABILITY OF GROUND EFFECT VEHICLES - THIN JET THEORY,
by William C. Webster. 1 Dec 60, 38p. illus. tables (Technical rept. no. 011-1)
(Contract Nonr-318900)
Unclassified report

DESCRIPTORS: *Ground effect, Stability, Aerodynamics, Jets, Mathematical analysis, Differential equations, Deflection, Aircraft.

A theoretical study of the static pitch stability of simple types of thin jet ground effect machines, including the influence of interior jets, is presented. Some simplifications and assumptions are made but these are kept to a minimum. Tulin's treatment of underfed and overfed jets is used and extended here to take into account the jet flow under the machine. In the expression for the pitching moment, certain nonlinearities are included. The importance of various physical parameters for pitch static stability is calculated and discussed. Two-dimensional machines tend to be unstable at all altitudes except possibly very close to the ground. The use of interior jets stabilizes the machine markedly; stability increasing with decreasing altitude. Increasing the stability generally results in decreased powering efficiency. The general behavior of three-dimensional machines is similar to that of the corresponding two-dimensional machines but with some improvement in stability. Charts are presented to allow the rapid estimation of the static pitch stability of simple machines. (Author)

AD-259 489 Div. 9, 31
(13 July 61) OTS price $4.60

St. Anthony Falls Hydraulic Lab., U. of Minn., Minneapolis.
PULSATION OF VENTILATED CAVITIES,
by C. S. Song. Feb 61, 42p. incl. illus. (Technical paper no. 32, Series B)
(Contract Nonr-71024, Proj. NR 062-052)
Unclassified report

DESCRIPTORS: *Cavitation, Ventilation, Hydraulic pressure, *Fluid mechanics, Gases, *Liquids, Oscillation, Resonance.

The problem of pulsating supercavities under artificial ventilation is analytically treated as a resonance problem of a two-dimensional gas-liquid system using a linearized method. A simple kinematical consideration and a dynamical model of the flow lead to solutions for frequency and amplitude of pulsations. The criteria of pulsation is given in terms of a formula relating the cavitation number based on the vapor pressure and the cavitation number based on cavity pressure. Maximum air carrying capacities of pulsating cavities are also estimated. Most of the formulas involve an undetermined constant which must be estimated by using experimental data. The analytical results are compared with the experimental data obtained at the St. Anthony Falls Hydraulic Laboratory, and in general, good agreement is obtained. It is found that pulsation is possible only for a two-dimensional cavity or a cavity in which a substantial portion of the span can be regarded as two-dimensional. The existence of a free surface is also essential to pulsation. The strong effect of the free surface suggests that pulsation may become an important problem in the open sea only when submergence is relatively small. (Author)

AD-259 534 Div. 9, 1
(13 July 61) OTS price $7.60

Princeton U., N. J.
EXPERIMENTAL DETERMINATION OF SPANWISE LIFT EFFECTS ON A WING OF INFINITE ASPECT RATIO SPANNING A CIRCULAR JET,
by Richard S. Snedeker. Feb 61, 75p. incl. illus. tables, 19 refs. (Rept. no. 525)
(Contracts Nonr-185814, Proj. NR 212-000 and Nonr-185801)
Unclassified report

DESCRIPTORS: *Aerodynamics, *Lift, Airfoils, Load distribution, Gas flow, Simulation, Jets, *Wings, Short take-off planes, Vertical take-off planes, Downwash, Tests, Theory.

The propeller slipstream-wing interaction and its effects on spanwise lift distribution are discussed. Recent theoretical and experimental work is briefly reviewed. A more detailed discussion is given of experiments which make use of circular nonrotating jets for slipstream simulation. Features of the present experimental program are presented with lift distributions showing marked correlation with the theory of Rethorst for a plane wing of infinite span. Additional results are presented for this wing with a .20c split flap at deflection angles of 20 and 40 deg. It is concluded that Rethorst's theory represents the most satisfactory approach to date for analyzing the spanwise effects of the interaction. (Author)

AD-259 672 Div. 9, 15, 30
(17 July 61) OTS price $19.75

Fluid Dynamics Research Lab., Mass. Inst. of Tech., Cambridge.
MONTE CARLO APPLICATION TO MOLECULAR FLOWS,
by J. K. Haviland. May 61, 299p. incl. illus. tables (Rept. no. 61-5)
(Contracts AF 19(604)5698 and AF 49(638)207)
(AFCRL-648) Unclassified report

DESCRIPTORS: *Numerical methods and procedures, Shock waves, *Heat transfer, Diffusion, Sheets, Research program administration, Gas flow, *Superaerodynamics, Mathematical computer data, Digital computers, Statistical distributions, *Partial differential equations.

Monte Carlo methods were programmed on the IBM 709 for two problems: the heat flow between parallel walls using hard sphere and Maxwellian molecules; and the normal shock wave, using hard sphere molecules. Three solutions were obtained to the heat flow problem, two for Maxwellian molecules at Knudsen numbers of .53 and 1.64, respectively, and one for hard spheres at a Knudsen number of 2.0. All three runs were at a temperature ratio of 4:1. Three solutions were obtained to the shock wave problem, at Mach numbers of 1.5, 2.0 and 3.0. Solutions were obtained in the heat flow problem to the four-moment full range equations, both for hard sphere and Maxwellian molecules, and one solution was obtained to the six-moment full range equations for Maxwellian molecules. (Author)

AD-259 682 Div. 9, 10
(17 July 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
EFFECT OF IMPINGEMENT ANGLE ON DROP-SIZE DISTRIBUTION AND SPRAY PATTERN OF TWO IMPINGING WATER JETS,
by Marcus F. Heidmann and Hampton H. Foster. July 61, 34p. incl. illus. (Technical note no. D-872)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-872.

DESCRIPTORS: *Jet mixing flow, Drops, *Sprays, Fuel sprays, *Liquid jets, Fuel injection, Water injection, Atomization, Liquid rocket propellants, Water impingement, Combustion chambers, Water, Photographic analysis.

Sprays produced by two 0.089-inch-diameter jets at impingement angles of 10 to 90 degrees and jet velocities of 30 to 74 feet per second were studied. Drop-size distributions for sprays formed in 100-foot-per-second air are presented. Distributions were bimodal in character, and the effects of test conditions on the bimodal properties are presented. Photographs of the overall spray pattern produced in quiescent air are also shown.

AD-259 734 Div. 9, 2
(18 July 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
RANGE OF DENSITY VARIABILITY FROM SURFACE TO 120 KM ALTITUDE,
by Orvel E. Smith and Halsey B. Chenoweth. July 61, 24p. incl. illus. tables, 36 refs. (Technical note no. D-612)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-612.

DESCRIPTORS: Re-entry aerodynamics, *Atmosphere, *Density, Height finding, *Atmosphere models, Standards, Ionosphere models, Thermodynamics, Determination, *Aerodynamic heating, Northern hemisphere.

A re-entry space vehicle development program, such as Project Apollo, requires a knowledge of the variability of atmospheric density from the

surface of the earth to re-entry altitude (120 km). This analysis summarizes the data on density given in the most recent literature on the subject. The range of atmospheric density with respect to the ARDC 1959 Model Atmosphere is determined and shown graphically. From the surface to 30 km altitude abundant information on density is available. From 30 to 90 km altitude the summarized reports of observations made at a limited number of stations were used. Between 90 and 120 km altitude the density is somewhat speculative, there being but few measurements available. The qualitative values for the variability of density above 30 km must be considered tentative. Variations of atmospheric density by latitude and seasons made it necessary to develop a family of curves rather than a single profile. Three curves are presented to show the range of density deviation versus altitudes with respect to the ARDC 1959 Model Atmosphere. Each curve is used for a specific latitude range and season. (Author)

AD-259 813 Div. 9, 1
(19 July 61) OTS price $13.50

Institute of Engineering Research, U. of Calif., Berkeley.
A THEORY OF THE DUCTED PROPELLER WITH A FINITE NUMBER OF BLADES,
by William B. Morgan. May 61, 192p. 41 refs.
(Series no. 82, Issue no. 19)
(Contract Nonr-22230)
Unclassified report

DESCRIPTORS: Theory, Aerodynamics, Aerial propellers, Vortices, *Gas flow, Fluid mechanics, Ducted fans, *Propeller blades, *Shrouded propellers, Airfoils, Integral equations, Mathematical analysis.

A theory for the ducted propeller is developed which is based on a linearized annular airfoil theory and a lifting-line propeller theory. The flow field of the annular airfoil is represented by a distribution of ring vortices and ring sources on a cylinder and where necessary a trailing vortex system. This approach allows the airfoil section to have an arbitrary shape although the annular airfoil itself is assumed to be axisymmetric. The ring source strength is shown to be a function of only the duct thickness while the ring vortex strength is a function of camber, thickness and the radial velocity induced on the cylinder by the propeller and duct trailing vortex system. In the presence of the propeller, two coupled singular integral equations are derived for the vortex strength which are reduced to two coupled Fredholm equations of the second kind. The flow field of the propeller is represented by a lifting line and a helicoidal trailing vortex system. By this approach, the problem reduces essentially to the propeller problem solved by Lerbs. The hub is treated by slender body theory which allows it to have an arbitrary axisymmetric shape. One consequence of using this theory is that the hub induces no tangential velocities. (Author)

AD-259 967 Div. 9, 27, 11
(21 July 61) OTS price $2.60

Hydronautics, Inc., Rockville, Md.
STATIC STABILITY OF GROUND EFFECT MACHINES - THICK JET THEORY,
by J. D. Lin. 1 June 61, 16p. illus. (Technical rept. no. 011-2)
(Contract Nonr-318900)
Unclassified report

DESCRIPTORS: *Ground effect, *Flying platforms, *Stability, Jets, Pressure, Jet mixing flow, Vehicles, Theory, Perturbation theory, Diffusion.

Static pitch stability of a two-dimensional edge-jet ground effect machine is investigated by using thick jet theory, an extension of Webster's thin jet theory (HYDRONAUTICS, Inc. Tech. Rept. No. 011-1). The theory is applicable to a machine operating very close to the ground with a height to width ratio smaller than 10%. Base pressure and cross flow under the machine are obtained from the momentum balance of the jets and machine at small pitch angles. Solutions are carried out by the method of perturbations to the first order. The effects of diffusion of the cross flow and friction under the machine are considered and their importance is demostrated by numerical examples. Results indicate that such a machine is statically stable very close to the ground but rapidly loses stability as the height increases and becomes unstable above a certain critical height. Without more detailed understanding of the complex cross flows the results remain to some extent qualitative. Results can be extended to predict static stability for a three-dimensional machine. (Author)

AD-259 979 Div. 9, 30
(21 July 61) OTS price $2.60

Mississippi State U., State College.
A FLOW VISUALIZATION STUDY OF STAGNATION SEPARATION,
by Philip Houck. 7 June 61, 19p. incl. illus.
(Research note no. 14)
(Contract Nonr-97801)
Unclassified report

DESCRIPTORS: *Gas flow, Visibility, Smokes, *Separation, Boundary layer, Aerosols, Wake, Cylindrical bodies, Wind tunnels, Vortices, Sheets.

Stagnation separation at the juncture of a cylinder and a flat plate causes the formation of a strong vortex at the base of the cylinder. In many cases a secondary smaller vortex is also found. From these studies a qualitative picture of such flow has been obtained. (Author)

## 10. FUELS AND COMBUSTION

AD-259 143 Div. 10, 14, 27
(7 July 61) OTS price $15.00

Rocketdyne, Canoga Park, Calif.
PROPELLANT LUBRICATION PROPERTIES INVESTIGATION. Final rept. 1 Feb 60-5 Jan 61,
by Myles F. Butner. June 61, 209p. incl. illus. tables (Rept. no. R-2458-4)
(Contract AF 33(616)6960, Proj. 3044)
(WADD TR 61-77) Unclassified report

DESCRIPTORS: *Liquid rocket propellants, *Rocket motors, *Lubricants, *Ethylenes, Amines, Methyl hydrazines, Hydrazines, Hydrogen, Oxygen, Nitrogen compounds, Tetroxides, Liquefied gases, Nitric acid, *Bearings, *Ball bearings, *Gears, Friction, Test methods, Test facilities, Physical properties, *Lubrication, Materials, Metals, Alloys, Rocket oxidizers, Effectiveness.

Results of friction and wear, ball bearing, and gear tests using RP-1, ethylene diamine (EDA), unsymmetrical dimethyl hydrazine (UDMH), $N_2H_4$, liquid H, LOX, $N_2H_4$, and inhibited red fuming nitric acid (IRFNA) as lubricants are reported. Satisfactory low-load, short-life bearing and gear operation was found where RP-1, LOX, liquid H, $N_2O_4$ and IRFNA were used as lubricants. EDA, UDMH, and $N_2H_4$ were unsuitable as lubricants for 440-C ball bearings or gears. Satisfactory low-load, short-life gear operation was found for Berylco 25 gears lubricated by these propellants. (Author)

AD-259 357 Div. 10, 27
(11 July 61) OTS price $15.00

Princeton U., N. J.
AN INVESTIGATION OF TRANSVERSE MODE COMBUSTION INSTABILITY IN LIQUID PROPELLANT ROCKET MOTORS. Technical rept. on Combustion Instability in Liquid Propellant Rocket Motors.
by F. H. Reardon. 1 June 61, 213p. incl. illus. tables (Aeronautical engineering rept. no. 550)
(Contract NOa(s) 60-6078-c)
Unclassified report

DESCRIPTORS: *Rocket motors, *Liquid rocket propellants, *Combustion, *Jet acoustic oscillations, Vibration, Combustion chamber gases, Combustion chambers, Fuel injectors, Fuel injection, Injectors, Design, Cylindrical bodies, Configuration, Theory, Mathematical analysis, Test methods, Test facilities, Stability.

The transverse modes of high frequency combustion instability in liquid propellant rocket motors are studied theoretically and experimentally. Preliminary experiment demonstrates the need for additional theoretical analysis to explain: (1) the influence on stability of the orientation of the elements of the injection pattern with respect to the radial direction; (2) the greater tendency to instability of the spinning forms of tangential modes as compared to the standing forms; and (3) the effect of the distribution of injection across the injector face. The basic theory is derived for the case of a circularly cylindrical combustion chamber with uniformly distributed injection. Extensions of the basic theory are made to cover the cases of nonuniformly distributed injection, a variable angle sector motor, and more general time lag formulations. A series of experiments using both sector and full cylindrical motors is described. (Author)

AD-259 409 Div. 10
(13 July 61) OTS price $5.60

Princeton U., N. J.
EXPERIMENTAL INVESTIGATION OF THE IGNITION PROCESS OF SOLID PROPELLANTS IN A PRACTICAL MOTOR CONFIGURATION.
by Robert W. Lancaster. 3 May 61, 52p. incl. illus. table, 10 refs. (Aeronautical Engineering Lab. rept. no. 548)
(Contract AF 49(638)960)
(AFOSR-836) Unclassified report

DESCRIPTORS: *Solid rocket propellants, Test methods, *Ignition, Propellant grains, Test equipment, Rocket motors, Chemical reactions, Heat transfer, Pyrolysis, Ammonium radicals, Perchlorates, Styrenes, Polymers, Pressure, Temperature, Time, Resins.

A study of the ignition process of a composite solid propellant (80 wt-% $NH_4ClO_4$ plus 20 wt-% P-13 resin and additives was made in a combustion chamber whose configuration resembled that of a practical solid propellant motor. A small gas rocket chamber generated high temperature gaseous products, which in turn supplied the ignition energy to the internal surface of a cylindrical thin-web, case-bonded solid propellant grain. The ignition delay, the time between igntion of the gas igniter and the first ignition of the solid propellant grain, was measured as a function of the temperature, pressure, the chemical reactivity of the hot gases, and the velocity of these gases over the solid propellant surface. The ignition times were measured by means of a strain-gage pressure transducer inserted in the solid propellant motor chamber. (Author)

AD-259 540 Div. 10
(13 July 61) OTS price $7.60

Ordnance Fuels and Lubricants Research Lab., Southwest Research Inst., San Antonio, Tex.
A VOLATILITY EXPRESSION FOR VAPOR-LOCK CONTROL.
by John N. Bowden, Dec 59, 74p. incl. illus. tables, 15 refs.
(Contract DA 23-072-ORD-1221, Proj. 551-01-011)
Unclassified report

DESCRIPTORS: *Gasoline, Vaporization, Fuel systems, Vapor pressure, Vapors, Liquids, Temperature, Quality control, Specifications, Military procurement.

A large number of experimental and commercial fuels were tested for vapor-forming characteristics with a vapor/liquid ratio apparatus. From these data, an indicator was developed and called the TVL index, which expresses the vapor-locking tendencies of a fuel. Vehicle vapor-lock tests served to correlate the laboratory work with the performance of fuels in vehicles and to tentatively establish volatility limits for military gasoline in terms of temperature-vapor/liquid ratio relationships. The TVL index limits would curtail the use of high concentrations of pentane as the pressurizing agent and would allow more use of fuels with relatively high Reid vapor pressures but low vapor-locking tendencies. The proposed limits are consistent with current Reid vapor pressure and ASTM distillation requirements for military gasoline; however, as an alternate recommendation, these could be modified slightly to eliminate fuels with high vapor-locking tendencies and to include those with low vapor-locking tendencies. (Author)

AD-259 553 Div. 10
(14 July 61) OTS price $3.60

Rocketdyne, Canoga Park, Calif.
RESEARCH IN HYBRID COMBUSTION.
Quarterly rept. for period ending 31 May 61, by M. V. Peck and R. M. Lodwig. 30 June 61, 26p. incl. illus. tables (Rept. no. R-2267-4)
(Contract Nonr-301600)
Unclassified report

DESCRIPTORS: *Combustion, *Acrylic resins, Rocket motors, Polymers, Methyl radicals, *Oxygen, Chemical reactions, Solids, Gases,

Flames, Laminar boundary layer, Temperature, Turbulent boundary layer, Reynolds number, Fluid flow, Gas flow, *Hybrid rocket propellants, *Rocket oxidizers, Diffusion.

The combustion processes of polymethylmethacrylate and gaseous oxygen have been investigated. A satisfactory model is demonstrated for the observed burning rates. The effect of oxygen atmospheres upon activation energy of the depolymerization reaction was also studied. (Author)

AD-259 652 Div. 10, 4
(17 July 61) OTS price $2.60

Texaco Experiment Inc., Richmond, Va.
PREFLAME REACTIONS IN THE AUTODECOMPOSITION OF ACETYLENIC COMPOUNDS.
Final rept.,
by U. V. Henderson, Jr. 31 Dec 59, 23p. incl. illus. (Rept. no. TP-161; EXP 259)
(Contract Nonr-248700)
Unclassified report

DESCRIPTORS: *Acetylenes, *Liquid rocket propellants, *Pyrolysis, *Combustion, Flames, Low pressure research, High pressure research, High temperature research, Polymerization, Chemical reactions, Reaction kinetics, Aldehydes, Allenes, Vinyl radicals, Ethers, Ethylenes, Allyl radicals, Molecular structure, Free radicals, Chemical bonds, Theory, Decomposition.

The autodecomposition reactions of compounds such as dipropargyl ether and 1,6-heptadiyne have been studied by examination of the high-pressure autodecomposition flame and by analysis of the products of the low-pressure pyrolysis of these and related compounds. The gaseous products of pyrolysis at 900 C. indicate the splitting of the long-chain molecules into two smaller molecules by a homogeneous gas-phase reaction proceeding by way of a cyclic intermediate and involving an internal proton shift and displacement. At this pyrolysis temperature polymerization also occurs to a considerable extent (about 50%) and homolytic cleavages to a slight extent (about 1-2%). Evidence was also found that the unimolecular cleavage either precedes or occurs concurrently with the high-pressure autodecomposition reaction. (Author)

AD-259 801 Div. 10
(18 July 61) OTS price $10.10

Wyle Labs., El Segundo, Calif.
ADDITIONAL INFORMATION AND DATA PERTAINING TO THE INSTALLATION AND OPERATION OF A STORABLE PROPELLANT FACILITY FOR TESTING OF TITAN II COMPONENTS AND SYSTEMS,
by James P. Cooper, Glen W. Howell and others. June 61, 129p. incl. illus. (Technical note no. 10690)
(Contract AF 04(647)398)
(AFBSD TN 61-34) Unclassified report

DESCRIPTORS: *Test facilities, Design, Operation, *Liquid rocket propellants, Storage, Handling, Rocket fuels, Rocket oxidizers, Hydrazines, Methyl hydrazines, Nitrogen compounds, Tetroxides, *Ground support equipment, Guided missiles, Test equipment, Test methods, Safety.

A stainless steel vapor scrubber was added to the test facility for scrubbing $N_2H_4$ vapors. Other minor modifications consisted of the addition of gaseous N purge lines, relocation of filters, and minor plumbing changes for adapting specific test specimens to the test systems. Evaluation summaries, data, and test procedures are presented in detail for the pre-qualification of Titan II propellant transfer system components. These components include (1) heat exchangers, (2) canned pumps, (3) piston-operated angle globe valves, (4) manually-operated globe valves, (5) manually-operated ball or plug valves, (6) check valves, (7) flexible hoses, (8) filters, (9) control valves (regulators), (10) relief valves, (11) liquid sensors, (12) pressure gages, and (13) differential pressure instruments. Smear, chemical compatibility, and mechanical tests were performed on 13 lubricants to determine their suitability for use with storable propellants. Additional safety information, practices, and procedures acquired during the pre-qualification test program are presented to amplify the safety practices outlined in AFBMD-TN-61-32 (AD-255 145).

## 11. GROUND TRANSPORTATION EQUIPMENT

AD-259 264 Div. 11
(11 July 61) OTS price $1.60

Army Arctic Test Board, Fort Greely, Alaska.
EVALUATION OF CRANE-SHOVEL, CRAWLER-MOUNTED, 40-TON P&H, WINTERIZED.
7 July 61, 9p. illus. (Proj. no. ATB 2-201)
Unclassified report

DESCRIPTORS: *Winterization kits, Arctic regions, *Earth moving equipment, *Heaters, Test equipment, Hoists, *Vehicle heaters.

The winterization components of the Crane-Shovel, Crawler-Mounted, 40-Ton, P&H, Winterized, was found to be suitable for Army use under arctic winter conditions when the deficiencies listed are corrected. (Author)

AD-259 632 Div. 11
(17 July 61) OTS price $1.60

Army Arctic Test Board, Fort Greely, Alaska.
CHECK TEST OF CONVERSION OUTFIT, GASOLINE DISPENSING, REAR-MOUNTED, CARGO VEHICLE TANKER (50 GPM CAPACITY).
9 June 61, 12p. (Proj. no. ATB 2-121)
Unclassified report

DESCRIPTORS: *Cargo vehicles, *Fuel tanks, Arctic regions, Tests, Trailers, Fuel trucks.

Tests indicate that the modified Conversion Outfit, Gasoline Dispensing, Rear-Mounted, Cargo Vehicle Tanker (50 GPM Capacity) should be suitable for army use under arctic conditions when the deficiencies, and as many shortcomings as practicable, are corrected. (Author)

# 12. GUIDED MISSILES

AD-259 094 Div. 12, 20, 30
(5 July 61) OTS price $11.50

Space Technology Labs., Los Angeles, Calif.
PROJECT ABLE-4.
Final mission rept., vol. 2.,
by Allen J. McMahon. May 61, 146p. incl. illus.
(Rept. no. STL/TR-60-V002-02092)
(Contract AF 04(647)302)
(AFBMD TR 61-34) Unclassified report

DESCRIPTORS: *Space probes, Spaceships, Space environment, *Planetary atmosphere, Interstellar matter, Terrestrial magnetism, Magnetic fields, Solar flares, *Cosmic rays, Cosmic ray telescopes, Ionization chambers, Meteorites, Telemeter systems, Data processing systems, Magnetometers, Instrumentation, Solar systems.

Pioneer V, 1960 Alpha, was successfully launched on 11 March 1960. It escaped the earth and was established in a solar orbit with the parameters, perihelion 0.806 A.U., aphelion 0.993 A.U., period 311.64 days. This space probe was equipped with a cosmic ray telescope, an ion chamber and geiger tube, a search coil magnetometer and a micrometeorite detector. Information was obtained descriptive of the far terrestrial magnetic field, the interface between the terrestrial field and the interplanetary field, and the properties of the interplanetary field. New knowledge was obtained concerning the Forbush decreases of cosmic ray intensity, the 11 year cycle in cosmic ray intensity, and evidence not inconsistent with a gradient in cosmic ray intensity. The Astronomical Unit was measured by analyzing the tracking data. Digital data from these experiments were telemetered to the Hawaii and Manchester ground stations until 26 June 1960 when Pioneer V was 22,462,000 nautical miles from the earth. (Author)

AD-259 122 Div. 12
(7 July 61) OTS price $4.60

Beech Aircraft Corp., Boulder, Colo.
ESTABLISHING TANK DESIGN CRITERIA FOR LIQUID HYDROGEN ROCKETS. VOLUME II. HEAT TRANSFER TO LIQUID HYDROGEN THROUGH CONDENSING AIR FILMS.
Final rept. Oct 58-1 July 61,
by D. A. Van Gundy. 1 July 61, 43p. incl. illus.
(Engineering rept. no. 8768)
(Contract AF 33(616)5154, Proj. 3084)
(AFFTC TR 60-43, vol. 2) Unclassified report

DESCRIPTORS: *Propellant tanks, *Liquid rocket propellants, *Hydrogen, *Liquified gases, Fuel tanks, Metal plates, Copper, Heat transfer, Aerodynamic heating, Cryogenics, Spaceships, Satellite vehicles, Launching, Air, Films, Condensation, Water, Humidity, Test facilities, Test methods, Design, Guided missiles.

The heat transfer coefficients to an uninsulated copper plate at 20 K were investigated. Data were taken over a range of air velocities, normal to the surface, of 0 to 21 mph, absolute humidity of air of 25 to 280 grains lb of dry air, and ambient air temperatures of 16 to 150 F. A theoretical analysis, description of experimental apparatus and procedure, experimental results, discussion, conclusions, and recommendations are presented. The results are summarized as follows: (1) Low ambient temperatures and absolute humidities inhibit and sometimes prevent frost accumulation on the test surface; (2) Steady state frost thickness increases with air velocity and absolute humidity; (3) Heat transfer coefficients exhibit a minimum point at all air velocities when plotted against absolute humidity; (4) The only theoretical analysis made was for the surface covered with a liquid air film. No correlation between theory and experimental data was found to exist. (Author)

AD-259 127 Div. 12
(7 July 61) OTS price $9.10

Institute of engineering research, U. of Calif. Berkeley.
FUNDAMENTAL ANALYSIS OF VARIOUS DYNAMIC STABILITY PROBLEMS FOR MISSILES,
by T. J. Conkley, E. V. Laitone, and W. L. Maas.
June 61, 96p. incl. illus. 13 refs. (Series no. 176, Issue no. 1)
(Contract AF 49(638)818)
Unclassified report

DESCRIPTORS: *Guided missiles, *Surface to surface, *Hypersonics, Guided missile trajectories, Mathematical analysis, Flight speeds, Spin, *Re-entry aerodynamics, Re-entry vehicles, Hypersonic flow, *Stability, Moments, Equations, Acceleration, Deceleration, *Atmosphere entry, Velocity, Density, Atmosphere, Stability (Longitudinal), Oscillation, Dynamics, Flight.

A theoretical analysis is made for special cases of the short period and the phugoid or long period oscillations of a non-rolling high speed missile that has a longitudinal plane of symmetry. The linearized equations of motion with time dependent coefficients are derived for short period oscillations of a hypersonic ballistic missile during rapid acceleration or deceleration. It is also shown that the effect of accelerated motion is strikingly different on either the w, q or alpha oscillations. An explicit relation is derived that shows that the atmospheric density gradient will produce a large decrease in the period of the phugoid oscillation, and that this effect increases with the velocity until near orbital speeds are approached. A new parameter is found which predicts the altitude at which the aerodynamic oscillations of a re-entry missile will will effectively begin. This new parameter allows the development of a universal curve which can be used for predicting the high altitude oscillations of hypersonic re-entry ballistic missiles for the linear pitching moment case. (Author)

AD-259 233 Div. 12, 19, 6
(11 July 61) OTS price $14.50

Martin Co., Baltimore, Md.
DYNAMIC ANALYSIS AND PRELIMINARY DESIGN FOR SATELLITE GUIDANCE SUBSYSTEM.
Final engineering rept.
June 61, 1v. incl. illus. tables, 24 refs. (Rept. no. ER 11647)
(Contract AF 33(616)6040)
Unclassified report

DESCRIPTORS: *Satellite vehicles, Guidance, *Control systems, Airborne, *Star trackers, *Orbital flight paths, *Satellite vehicle trajectories, Reliability, Manned, Radio altimeters, Radar equipment, Infrared tracking,

Infrared equipment, Stabilization, Satellite attitude, Power supplies, Retro rockets, Digital computers, Programming, Design, Errors, *Celestial guidance.

A self-contained guidance and control system for a hypothetical, unmanned one-year mission in space is presented. System operation is based on the use of altitude measurements to define the in-plane orbit parameters and preselected star occultation time measurements to define the orbit plane orientation parameters. Over-all system operation is presented and system errors are evaluated, using an IBM 7090 computer program. A detailed description of each of the subsystems is given and the reliability of these systems is predicted for the one-year mission, using component failure rate data. It is shown that the system could be instrumented using state-of-the-art hardware. A preliminary missions analysis indicates that the system would have considerable utility in manned satellite missions requiring exit from orbit and rendezvous with earth-based target points. (Author)

AD-259 325 Div. 12
(10 July 61) OTS price $4.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
LUNAR PROBES AND LANDINGS. AN ANNOTATED BIBLIOGRAPHY,
comp. by George R. Evans. May 61, 40p. 105 refs. (Special bibliography no. SB-61-24; Rept. no. LMSD-5-10-61-3)
Unclassified report

DESCRIPTORS: *Lunar probes, *Bibliography, Moon, Landing, *Spaceships, Space probes, Design, Space environmental conditions, Astronautics.

An annotated bibliography of 105 references is presented which is concerned primarily with lunar probes, lunar landings, design configurations, and materials applicable to spaceships. This literature search was submitted in support of a program for an eventual lunar landing. The period covered by the search was generally from January 1959 to the present. (Author)

AD-259 372 Div. 12, 1
(10 July 61) OTS price $8.60

Stanford U., Calif.
THE EFFECTS OF TEMPERATURE AND TIME ON AIRCRAFT AND MISSILE STRUCTURES,
by Nicholas J. Hoff. Jan 61 88p. incl. illus. tables (Rept. no. SUDAER 99)
(Contract AF 49(638)223)
(AFOSR-646)
Unclassified report

DESCRIPTORS: *Airframes, *Airplanes, Creep, *Guided missiles, *Rockets, Temperature, Aerodynamic heating, Thermal stresses, Solid state physics, Deformation, Ablation, Reentry aerodynamics, Elastic shells, Thermodynamics, Metallurgy, Simulation, Stresses, Plasticity, Elasticity, Cylindrical bodies, Heat transfer, Structural shells, Buckling.

A survey is made of the new problems introduced in the structural analysis of airplanes and missiles by the high temperatures caused by aerodynamic heating. Thermal stresses, thermal buckling, the effect of creep on stress distribution and stability, and ablation are discussed and special attention is paid to the behavior of the pure shells used in missiles. It is concluded that the modern structural analyst must acquire a knowledge of many disciplines that were of no interest to his predecessor working before World War II. Among these disciplines are thermodynamics, metallurgy, and the physics of the solid state. In all the new problems two parameters appear that did not enter classical structural analysis. The first is temperature which is the cause of all the difficulties of the modern structural designer and analyst. The second is time, because at high temperatures no structure can carry loads for indefinitely long periods. One of the most important tasks of the analyst of missiles is the determination of the lifetime of the structure. (Author)

AD-259 427 Div. 12, 6
(12 July 61) OTS price $4.60

Air Force Cambridge Research Labs., Bedford, Mass.
MEASURED RADAR BACKSCATTER CROSS SECTIONS OF THE PROJECT MERCURY CAPSULE,
by R. B. Mack and B. B. Gorr. Feb 61, 45p. incl. illus. tables. (Rept. no. AFCRL-38)
Unclassified report

DESCRIPTORS: *Radar echo areas, *Radar reflections, *Space capsules, *Radar tracking, Model tests, Electromagnetic waves, Retro rockets, Ultra high frequency, Superhigh frequency, Simulation, Satellite vehicles, Microwave frequency, L band, S band, X band, Scattering, Measurement.

The feasibility of tracking the Project Mercury capsule with active radars depends on the radar scattering characteristics of the capsule. Radar backscatter cross sections of the Project Mercury capsule were measured by standard modeling techniques at simulated radar frequencies of 440, 933.3, 1184, 2800, and 5600 mc, and for climb angles alpha of 0, 15, 30, 45, 60, 75, and 90 degrees. Both horizontal and vertical polarizations were used. The largest backscatter cross section sigma over the widest angular intervals were obtained at 933.3 and 2800 mc. Values of delta were somewhat higher at 933.3 mc than at 2800 mc. (Author)

AD-259 438 Div. 12
(13 July 61) OTS price $4.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
NUTATION DAMPER. A SIMPLE TWO-BODY GYROSCOPIC SYSTEM,
by S. J. Zaroodny and J. W. Bradley. Apr 61, 44p. incl. illus. (BRL rept. no. 1128)
(Proj. 503-03-001)
Unclassified report

DESCRIPTORS: *Damping, *Gyroscopes, Nonlinear differential equations, *Satellite vehicles, Stability, Spin, Friction, Mathematical analysis, Aerial reconnaissance, *Astronautics, Satellite attitude, Nonlinear systems.

The behavior of an assembly of two rigid bodies - a device suggested as a nutation damper for observation satellites - is studied. For the present empirical approach, one of the bodies is chosen to be a thin rod, the other a thin disk; solutions of the equations are inspected for various values of the friction parameter. (Author)

AD-259 457 Div. 12
(12 July 61) OTS price $4.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
AN EXPERIMENTAL STUDY OF DATA CAPSULE EJECTION THROUGH A NOSE-CONE TRAILING WAKE,
by Leonard C. MacAllister and Anthony M. Smith. Jan 61, 45p. incl. illus. table (BRL memo. rept. no. 1325)
(In cooperation with General Electric Co.)
Unclassified report

DESCRIPTORS: Guided missiles, Surface to surface, *Guided missile noses, Model tests, Velocity, *Re-entry aerodynamics, Deceleration, Tests, Transonics, Simulation, Gun launched, Separation, *Space capsules, Ejection, Wake, Recovery.

The problem of secondary body ejection through a primary body's trailing wake has been experimentally investigated in a ballistic firing range. Specifically, the ICBM Mark 2 nose cone and its associated R and D data capsule have been studied to quantitatively ascertain the integrated wake-capsule interaction phenomena which occur during separation of the two bodies. It is shown, that in the model system, capsule escape from the nose cone will not result if initial ejection velocities are not sufficiently large. In terms of the full scale system, a wake function is generated from the test data which can adequately serve to modify the nose cone-capsule separation trajectory equations to account for the presence of the wake, and thus insure capsule escape. (Author)

AD-259 496 Div. 12, 2
(14 July 61) OTS price $1.75

National Aeronautics and Space Administration, Washington, D. C.
EMPIRICAL THREE-SIGMA WIND COMPONENT PROFILES 45-DEGREE MISSILE FLIGHT AZIMUTH ATLANTIC MISSILE RANGE PATRICK AFB (CAPE CANAVERAL), FLORIDA,
by William W. Vaughan. July 61, 63p. incl. illus. tables (Technical note no. D-606)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-606.

DESCRIPTORS: *Wind, *Guided missile trajectories, Meteorological data, Velocity, Safety, Florida, Guided missiles, Exterior ballistics, Statistical analysis, Weather forecasting.

A statistical summary in the form of wind component profiles for the annual and individual monthly periods for Patrick Air Force Base (Cape Canaveral), Florida. The profiles presented provide an envelope about the three-sigma (99.865 percent cumulative frequency) values for the headwind, tailwind, right crosswind, and left crosswind components with reference to a missile flight azimuth of 45 degrees east of north. These data are intended primarily for use in range safety studies. (Author)

AD-259 560 Div. 12, 26, 17
(13 July 61) OTS price $7.60

Temco Aircraft Corp., Dallas, Tex.
(No title).
Final engineering summary rept.
by W. D. Sundland. 21 July 60, 78p. incl. illus.
(Rept. no. 028.11)
(Contract DA 23-072-501-ORD-46)
Unclassified report

DESCRIPTORS: *Guided missile noses, *Guided missile fuzes, *Adapters, Manufacturing methods, Machining, Aluminum alloys, Magnesium alloys, Design.

Engineering details are presented for the production of body assemblies, fuzing supports, and adapter assemblies.

AD-259 604 Div. 12, 2
(17 July 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE ORBIT OF THE THIRD SOVIET COSMIC ROCKET (LUNIK 3),
by V. T. Gontkovskaya and G. A. Chebotarev. 26 May 61, 10p. incl. illus. tables (Trans. no. MCL-987 of Astronomicheskiy Zhurnal 38:125-130, 1961)
Unclassified report

DESCRIPTORS: *Lunar probes, *Orbital flight paths, Celestial mechanics, Space flight, *Rocket trajectories, Perturbation theory, Differential equations, USSR.

AD-259 639 Div. 12, 30
(17 July 61) OTS price $1.60

Air Force Special Weapons Center, Kirtland Air Force Base, N. Mex.
BLUE SCOUT EXPERIMENTS FOR VELA HOTEL,
by Lew Allen, Jr. Apr 61, 17p. incl. illus.
(Rept. no. AFSWC TN 61-10)
(Proj. 7811)
Unclassified report

DESCRIPTORS: *Space probes, *Space environmental conditions, Gas ionization, Ionization, High altitude, *Nuclear explosions, *Satellite vehicles, Detection, Scientific research, Space flight, *Guided missiles, Test methods, Instrumentation, Spaceships.

A series of experimental space flights will be made during 1961 using versions of the Air Force TS 609A or Blue Scout vehicle. The Air Force Special Weapons Center, Los Alamos Scientific Laboratory and Sandia Corporation are collaborating in the experiments to be formed on 5 of these flights. Each of these flights will obtain data relating to the space environment at altitudes varying from about 100 km to as high as 100,000 km. All of the measurements are of various characteristics of the ionizing radiation present in space. The experiments support the Air Force research program in the phenomenology of high altitude nuclear explosions. Several of the experiments, particularly those using the Blue Scout Junior rocket, are designed to support Vela Hotel which is the research program to determine the necessary characteristics of a satellite-borne system for the detection of high altitude nuclear explosions. The planned experiments and their relationship to the Vela Hotel effort are briefly described. (Author)

AD-259 666 Div. 12, 19
(17 July 61) OTS price $6.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
ANALYSIS OF INERTIAL GUIDANCE POSITION ERRORS

CAUSED BY ERRORS IN REFERENCE VELOCITY.
Master's thesis,
by Joseph P. Crocco. Aug 61, 62p. incl. illus. tables (Rept. no. GGC/EE/61-5)
Unclassified report

DESCRIPTORS: *Guided missiles, Air to surface, Guidance, *Inertial guidance, Errors, Mathematical analysis, Differential equations, Integral equations, Probability.

Doppler velocity can be used to perform the in-flight alignment of inertial guidance systems. Reference velocity errors, both noise and bias, cause initial guidance system velocity errors and intial platform tilt errors, which in turn cause position errors. The values of these initial errors must be found to determine their effect on the position errors. The position error propagation equation was developed and the position error and CEP of the missile due to reference velocity errors were found. Also, the dependence of the position error on the half-power frequency of the reference velocity noise was investigated. (Author)

AD-259 683 Div. 12, 25
(17 July 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
MEASUREMENTS OF SHEATH CURRENTS AND EQUILIBRIUM POTENTIAL ON THE EXPLORER VIII SATELLITE (1960ξ),
by R. E. Bourdeau, J. L. Donley, and others. July 61, 25p. incl. illus. (Technical note no. D-1064)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-1064.

DESCRIPTORS: Experimental data, *Satellite vehicles, Ionosphere, Photoemission, Plasma physics, Spaceships, *Space environmental conditions, Telemeter systems, Instrumentation, Solar energy, Electric currents, *Ionization potentials.

Experimental data were obtained from the Explorer VIII satellite on five parameters pertinent to the problem of the interaction of space vehicles with an ionized atmosphere. The five parameters are: photoemission current due to electrons emitted from the satellite surfaces as a result of solar radiation; electron and positive ion currents due to the diffusion of charged particles from the medium to the spacecraft; the vehicle potential relative to the medium, and the ambient electron temperature. Included in the experimental data is the aspect dependence of the photoemission and diffusion currents. On the basis of the observations, certain characteristics of the satellite's plasma sheath are postulated. (Author)

AD-259 830 Div. 12
(20 July 61) OTS price $2.60

Air Force Proving Ground Command, Eglin Air Forte Base, Fla.
SAFETY OF PERSONNEL DURING AN IM-99A MISSILE LAUNCHING,
by Sherrill G. Laney. June 61, 24p. incl. illus. tables (Rept. no. APGC TN 61-24)
Unclassified report

DESCRIPTORS: Personnel, *Safety, *Launching, Hazards, *Guided missiles, Physiology, Ear, Respiratory system, Exhaust gases, Toxicity, Tests, Air, Temperature, Noise, Laboratory animals, *Surface to air.

The objective of this test was to determine the relative safety of personnel in several selected areas during an IM-99A launching. Data were collected relative to free-air temperature, noise, and toxic gases which contribute to personnel hazards. Based on the analysis of the data obtained by physical measurements and from test animals, survivability of personnel remaining at five of the seven test locations in the launch area during missile launchings would be 100%. However, personnel remaining in the launch area may experience both temporary and permanent ear damage and irritations of the respiratory tract resulting from toxic gas exposure. (Author)

AD-259 990 Div. 12, 25, 6
(24 July 61) OTS price $1.60

Naval Research Lab., Washington, D. C.
THE DISTRIBUTION OF REFLECTING CROSS SECTIONS OF SATELLITES.
Interim rept.,
by R. E. Brescia and R. R. Zirm. 25 May 61, 10p. incl. illus. (NRL rept. no. 5615)
Unclassified report

DESCRIPTORS: *Satellite vehicles, Detection, *Probability, *Radar echo areas, Radar signals, Radar reflections, Radar tracking, Measurement.

The bistatic radar cross section of five artificial earth satellites was measured with the Navy's Space Surveillance sensors. The statistical variation of these quantities must be known in order to calculate system probability of detection and is also of value in forming estimates of target geometry, size, and motion. It was determined that the long-term fluctuation in apparent size of these objects follows a log-normal distribution with a standard deviation probably dependent on object geometry and motion. For symmetrical, stabilized objects the standard deviation is approximately 5 db, while for a cylindrical tumbling object it was found to be about 7 db. Confidence intervals for reflecting cross section are given in terms of deviation from the log mean of the calculated values of area. (Author)

AD-259 999 Div. 12, 8, 25, 30, 6
(24 July 61) OTS price $5.00

National Aeronautics and Space Administration, Washington, D. C.
JUNO II SUMMARY PROJECT REPORT. VOLUME I EXPLORER VII SATELLITE.
July 61, 356p. incl. illus. tables, 13 refs. (NASA Technical note D-608)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-608.

DESCRIPTORS: *Satellite vehicles, Satellite vehicle trajectories, *Scientific research, Booster rockets, Staging, Accelerometers, Instrumentation, Stabilization, Antennas, Satellite vehicle antennas, Design, Packaging, Telemeter systems, Electronic circuits, Radar tracking, Electrical equipment, Solar cells, Temperature, Test methods, Test equipment, Cosmic rays, Measurement, Ionization, Upper atmosphere, *Space environmental conditions,

Solar energy, Meteorites, Penetration, Protons, *Astrophysics, Electronic equipment, Nuclear physics, Geophysics, Timing circuits, Thermal radiation.

Contents:
The Explorer VII flight
Mechanical system, design engineering and packaging of Explorer VII
Telemetry design
Networks and solar power systems for the Explorer VII satellite
Thermal properties of Explorer VII
Testing
Heavy primary cosmic ray experiment
Satellite solar X-ray and lyman-alpha photometry experiments
The micrometeorite penetration experiment
The thermal radiation balance experiment onboard Explorer VII
Radiation and solar proton observations with Explorer VII

# 13. INSTALLATIONS AND CONSTRUCTION

AD-259 138 Div. 13
(7 July 61) OTS price $8.10

Naval Civil Engineering Lab., Port Hueneme, Calif.
BLAST LOAD TESTS ON POST-TENSIONED CONCRETE BEAMS, by H. T. Miyamoto and J. R. Allgood. 29 May 61, 87p. incl. illus. tables (Technical rept. no. 116)
(DASA-1198) Unclassified report

DESCRIPTORS: *Concrete, *Beams, Blast, Tests, Reinforcing materials, *Reinforced concrete, Physical properties, Design, Test equipment, Test methods.

Four types of post-tensioned prestressed concrete beams with straight unbonded bars were tested under static and blast loading to study their behavior. The tests showed that the response of prestressed beams can be predicted by a one-degree of freedom system provided the correct damping and resistance functions are known. The logarithmic decrement of the beams was about 0.05 to 0.28, which permitted negative deflections to develop under short-duration loading. A recommended dynamic design procedure is given. (Author)

AD-259 260 Div. 13
(11 July 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
MECHANIZATION OF CONSTRUCTION (SELECTED ARTICLES).
14 Apr 61, 18p. incl. illus. tables (Trans. no. MCL-816 of Mekhanizatsiya Stroitel'stva 6:pp. 8-12, 30-31, June 60).
Unclassified report

DESCRIPTORS: *Construction, Industrial equipment, *Booms, *Hoists, USSR, Machines.

Contents:
Automobile cranes for building and assembling operations by A. V. Golinenko
Hoisting and transporting machinery, by G. G. Zelichenok

AD-259 262 Div. 13, 11
(11 July 61) OTS price $1.60

Army Arctic Test Board, Fort Greely, Alaska.
EVALUATION OF COMPRESSOR, AIR TRAILER-MOUNTED, 600 CFM, INGERSOLL RAND, WINTERIZED.
26 May 61, 11p. incl. illus.
(Proj. ATB 2-191)
Unclassified report

DESCRIPTORS: *Winterization kits, Heaters, *Vehicle heaters, Arctic regions, Tests, Trailers, Compressors, Test equipment, Safety.

Tests indicate that the winterization components of the compressor, Air, Trailer-Mounted, 600 CFM, Ingersoll-Rand, Winterized, should be suitable for Army use under arctic winter conditions when the deficiencies listed are corrected. (Author)

AD-259 263 Div. 13, 11
(11 July 61) OTS price $1.60

Army Arctic Test Board, Fort Greely, Alaska.
EVALUATION OF GRADER, ROAD, MOTORIZED, HUBER-WARCO, MODEL 4 D115, WINTERIZED.
26 May 61, 17p. incl. illus.
(Proj. ATB 2-161)
Unclassified report

DESCRIPTORS: Arctic regions, *Graders, Vehicle heaters, Tests, Test equipment, Heaters.

Tests indicate that the winterization components of the Grader, Road, Motorized, Huber-Warco, Model 4 D115, Winterized, should be suitable for Army use under arctic winter conditions when the deficiencies, and the shortcoming if practicable are corrected. (Author)

AD-259 268 Div. 13, 2
(11 July 61) OTS price $3.60

Arctic Inst. of North America, Washington, D. C.
RECONNAISSANCE OF EMERGENCY WATER SUPPLIES, EAST GREENLAND,
by Stanley N. Davis, Apr 60, 34p. incl. illus. tables, 10 refs. (Scientific rept. no. 4; Research paper no. 4)
(Contract AF 19(604)3073)
(AFCRC TN 60-418) Unclassified report

DESCRIPTORS: *Water supplies, *Greeland, Ice, Snow, Lakes, Silicon compounds, Dioxides.

Reconnaissance observations verify the presence of abundant emergency sources of fresh water in East Greenland. Perennial sources of unfrozen water are, however, confined to lakes and valley bottoms having alluvium or outwash at least 30 feet thick. Approximate analyses of 36 water samples and precise analyses of 10 of the same samples indicate water of good to excellent chemical quality. Comparisons made with analyses from tropical and temperate regions fail to show chemical differences that are only due to variations of temperature and vegetation. CONCLUSIONS: Snowfields, glaciers, lakes streams, and springs, generally contain water of excellent chemical quality in East Greenland. Although concentrations of total dissolved solids are generally low, chemical weathering must be quite active during the short melt season. Silica concentrations appear to be slightly lower in water from East Greenland than in water from the United States. The contrast may be due to differences in runoff rates rather than differences in temperature and vegetation. (Author)

# Division 14 - MATERIALS (NON-METALLIC)

AD-259 327 Div. 13, 20, 22
(13 July 61) OTS price $3.60

Rand Corp., Santa Monica, Calif.
STRUCTURES UNDER REPEATED BLAST LOADINGS,
by Paul Weidlinger. 3 Mar 61, 29p. incl. illus. table (Research memo. no. RM-2715)
(Contract AF 49(638)700)
Unclassified report

DESCRIPTORS: Structures, Vulnerability, *Blast, Elasticity, Plasticity, Deformation, Load distribution, Nuclear explosions, Targets, Shock waves, Steel, Reinforced concrete, *Buildings, Surface targets.

The vulnerability of a target subjected to a series of repeated shots is examined. It is shown that properly designed elasto-plastic structures are capable of surviving the cumulative effects of repeated blasts if each blast is less intense than a destructive single blast. The blast intensity of a small number of repeated shots need not be significantly smaller than the intensity of a single destructive blast to permit the survival of most structures. The probability of kill, taking into account the cumulative effects of a series of blasts, is determined and it is shown that it is not significantly higher than the probability of kill obtained by neglecting cumulative damage. (Author)

AD-259 600 Div. 13
(14 July 61) OTS price $10.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
STRENGTH PROBLEMS IN MACHINE CONSTRUCTION (SELECTED PARTS) (Problemy Prochnosti V Mashinostroyenii),
20 Mar 61, 120p. incl. illus. tables, 32 refs.
(Trans. no. MCL-504 of Izdatel'stvo Akademii Nauk SSSR, Moscow, pp. 26-70 and 89-95, 1959)
Unclassified report

DESCRIPTORS: *Machines, Structures, Design, Mechanical properties, Stresses, Fatigue (Mechanics), Metal joints, Load distribution, Mechanical engineering, Impact shock, USSR, Industrial equipment, Mathematical analysis.

Contents:
The effectiveness of stress-relieving action for a finite number of equal holes (notches), by R. D. Vagapov and O. I. Shishorina
The general principles of methods for calculating the endurance of machine metal structures, by M. M. Gokhberg
Measuring the yield point under impact load, by Yu. Ya Voloshenko-Klimovitskiy

AD-259 835 Div. 13, 29, 16
(31 July 61) OTS price $2.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
SHELTER HABITABILITY STUDIES - THE EFFECT OF OXYGEN DEPLETION AND FIRE GASES ON OCCUPANTS OF SHELTERS,
by J. S. Maraoka. 18 July 61, 32p. incl. illus. tables, 37 refs. (Technical rept. no. 144)
(Proj. Y-F011-05-401(b))
Unclassified report

DESCRIPTORS: Oxygen consumption, Fires, *Shelters, Man, Carbon dioxide, Physiology, Gases, Air, *Anoxia, Respiration, Casualties, Oxygen equipment, *Protective coverings, Purification, Chemicals, *Hazards, Heat tolerance, Poison tolerance, Poison gases, Radioactive fall-out, Ventilation, Lithium compounds, Textroxides, Hydroxides, Potassium compounds.

A literature study on the effects of various gases on shelter occupancy was conducted. Various physiological effects from simple headache to unconsciousness and death are experienced by personnel in closed occupied rooms by breathing air containing excess carbon dioxide and carbon monoxide, or inadequate oxygen. During fire catastrophes, casualties result from flames, heat, and falling objects, but a greater number of casualties are caused by fire gases, carbon monoxide, which infiltrate open shelters. Shelters exposed to the hazard of mass fire should have all their openings closed to prevent the entrance of fire gases, and should employ chemical oxygen generators and carbon dioxide absorbents for air revitalization. These chemicals will produce better breathing conditions inside closed shelters. However, since they also produce heat during chemical reaction, their use must be limited. (Author)

# 14. MATERIALS (NON-METALLIC)

AD-259 053 Div. 14
(5 July 61) OTS price $1.60

Material Lab., New York Naval Shipyard, Brooklyn, N. Y.
POLYMERIC COMPOUNDS TO IMPROVE THE FASTENING STRENGTH OF WOOD WITH WOOD FASTENERS.
Final rept.,
by J. M. Nicholson. 5 Aug 60, 18p. incl. illus.
(FSP Proj. 29)
Unclassified report

DESCRIPTORS: *Wood, Joints, *Polymers, *Metal screws, Screw threads, Lubricants, Preservation, Impregnation, Plywood, Fiberboard, Epoxy resins, Esters, Beeswax, Chemical reaction, Decomposition, Lubrication, Deterioration.

Three polymeric compounds were evaluated and compared with beeswax as a coating for steel screws used as fasteners for wood joints: (1) a moderately viscous polyester; (2) a moderately viscous epoxy; and (3) a free flowing epoxy. The results indicated that the polymers increased the holding power of the screws in 4 kinds of wood (cypress, Douglas fir, teak, and white oak) from about 10 to 50%. The increase in holding power in plywood and particle board was about 20 to 40%, respectively. The corrosivity of the 4 woods was decreased about 65 to 95% when epoxy polymers were used. A significant decrease in driving resistance was obtained by the use of the epoxy based polymeric compounds.

AD-259 062 Div. 14, 26
(5 July 61) OTS price $1.10

Naval Engineering Experiment Station, Annapolis, Md.
THE ROLLING LOAD CARRYING CAPACITY OF SINTERCAST

CERMETS.
Research and Development rept.,
by R. L. Mohan. 2 Apr 59, 6p. incl. illus. table.

Unclassified report

DESCRIPTORS: Bearings, *Roller bearings, *Cermets, Refractory materials, Titanium compounds, Carbides, Nickel alloys, Chromium alloys, Cobalt alloys, Tungsten alloys, Shear stresses, Tests, Fatigue (Mechanics), Abrasion, Failure (Mechanics), Microstructure, Porosity, Sintered alloys, Load distribution.

Cermet rollers composed of about 67 vol-% TiC infiltrated with Inconel 700 (Ni-Cr alloy) or Haynes Stellite 31 (Co-Cr-W alloy) were rotated together under load, and the number of cycles to failure was recorded. The load carrying capacity at room temperature (with ample lubrication) of the cermet rollers at 10 to the 7th power cycles was about 150 lb or about 12% loadwise, and 75% stresswise, that of SAE 52100 steel. Failure of the rollers occurred by (1) fatigue spalling similar to that of homogeneous metallic structures, (2) abrasion and pitting, and (3) collapse of material subsurface to the track, resulting in a nonuniformly curved surface. An excessive amount of microporosity was present in both cermets, and areas of macroporosity were apparent in the specimen of TiC-Haynes Stellite. Studies were continued at 500, 700, and 1000 F.

AD-259 064 Div. 14, 31
(6 July 61) OTS price $1.60

Material Lab., New York Naval Shipyard, Brooklyn.
LUMBER, HARDWOOD, OAK, WHITE, FOR SHIP AND BOAT CONSTRUCTION; FORWARDING OF DRAFT OF.
Final rept.,
9 Jan 61, 11p. incl. illus. tables.
(Lab. proj. 5829-2)

Unclassified report

DESCRIPTORS: *Wood, Specifications, Varnishes, Pigments, Boats, Ship hulls, *Naval vessels, Deflection, Quality control, Sampling, Naval procurement, Standards, Preservation, Packaging, Materials.

This specification covers white oak lumber for ship and boat construction, including white oak lumber for bending as used in ship and boat frames or for other parts requiring bend of similar severity. (Author)

AD-259 068 Div. 14, 4
(6 July 61) OTS price $4.60

Narmco Industries, Inc., San Diego, Calif.
RESEARCH AND DEVELOPMENT OF HIGH TEMPERATURE STRUCTURAL ADHESIVES.
Quarterly progress rept. no. 3, 1 Mar-1 June 61, by Harold H. Levine. June 61, 41p. incl. illus. tables.
(Contract NOw 61-0254-c)

Unclassified report

DESCRIPTORS: *Adhesives, *Heat resistant polymers, *Laminates, *Resin adhesives, Resins, Pyrolysis, Preparation, Mechanical properties, Synthesis, Phenolic resins, Epoxy resins, Polymerization, Polymers, Silicone resins, Bonding, Metals, Tensile properties, Glass textiles.

Constructive pyrolysis of laminates at 1800 F in an Ar atmosphere results in a major improvement in oxidation resistance when exposed to circulating air at either 650 or 900 F. A silicone laminate, after this treatment, lost only 1.5% of its remaining resin content after 33 hr at 900 F. Despite the high pyrolysis temperature, the laminates retained a large amount of their organic resin. The low resistivity after pyrolysis, ranged from 4 to 70 ohm-cm. The phenolic-181 E glass laminate had a room temperature flexural strength of just under 10,000 psi and a modulus of 5.4 million psi. Mechanism studies on the sulfide curing compounds indicate that the type of epoxy polymerization is dependent upon the S compound. Arsenic trisulfide appears to undergo a sulfur-oxirane oxygen exchange, as does thiourea and dithiocarbamate salts. Synthetic efforts have resulted in a polymer containing a -Si-O-Co- chain by reaction of cobalt acetate with dialkoxysilane. Metal salts of 2-mercaptobenzothiazole were prepared and used to cure epoxy novolaks for mechanism studies and adhesive preparations. (Author)

AD-259 076 Div. 14
(6 July 61) OTS price $1.60

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
THERMAL PROTECTION CAPACITY OF AVIATOR'S TEXTILES,
by Alice M. Stoll. 22 May 61, 11p. incl. illus. tables (Rept. no. NADC-MA-6120)
(WepTask no. RAE 20J020/2021/F012 10 008)

Unclassified report

DESCRIPTORS: *Protective clothing, Aviation personnel, Thermal insulation, Burns, *Textiles, Cotton textiles, Woolen textiles, Nylon, *Fire resistant textiles, Countermeasures, Tests.

Since the advent of high-speed aircraft and nuclear warfare, the need for protection of personnel from thermal injury has been greatly emphasized. Among the more immediate aviation needs is that for fire-resistant anti-G clothing. An interim method has been devised for the selection and evaluation of textiles on the basis of their resistance to degradation by thermal irradiation of appropriate intensity and their protective capacity when in contact with living skin. Although field testing is not yet complete, a satisfactory thermally-resistant anti-G suit appears to have been achieved through this effort. This suit is fabricated of DuPont Experimental Fiber HT-1 in a twill weave and double-layer construction. On the basis of percentage of total body burns indicated by fuel flame exposures of clothed dummies, it has proven superior to a double-layer nylon suit and the regulation fire-retarded cotton coverall over the cutaway anti-G suit. The present method is being modified to yield surface temperature measurements during irradiation to provide for the ultimate goal of devising a thermal protection index based on previously established relationships between these temperatures and the tissue damage resulting from thermal irradiation. (Author)

AD-259 100 Div. 14
(5 July 61) OTS price $2.60

United States Rubber Co., Wayne, N. J.
HIGH TEMPERATURE RADIATION RESISTANT MATERIALS.
Progress rept. no. 1, 25 July-31 Oct 60.

by C. I. Carr and R. Miller. 21 Nov 60. 20p. incl. illus. tables.
(Contract NObs-84025)
Unclassified report

DESCRIPTORS: *Elastomers, *Ethylenes, *Polymers, Carbon black, Reinforcing materials, *Antioxidants, *Oxidation inhibitors, Antimony compounds, Oxides, Hydrocarbons, Chlorides, Vinyl chlorides, Oxidation, Aging, High temperature research, Materials, Radiation damage, *Butyl rubber, Mechanical properties, Air, *Propenes, *Heat resistant polymers, Additives, *Plastics.

A carbon black-reinforced polyethylene containing 9 parts of Sb203 and 5 parts of polyvinyl chloride retained 92% of its room temperature tensile strength and 83% of its elongation after being aged 4 days at 450 F. in air. A carbon black-reinforced polyethylene containing 5 parts of both Sb203 and polyvinyl chloride and cured by electron irradiation retained 73% of its 450 F. tensile strength and 55% of its elongation after being aged at 450 F. for 3 days in air. Both ethylene propylene copolymer and Butyl 035 can be protected against the effects of air aging at 350 F. by employing Sb203 and Hypalon 40 in the stocks. (Author)

AD-259 107 Div. 14
(5 July 61) OTS price $1.10

United States Rubber Co., Wayne, N. J.
HIGH TEMPERATURE RADIATION RESISTANT MATERIALS.
Progress rept. no. 2, 1 Nov 60-31 Jan 61,
by C. I. Carr and R. Miller. 15 Feb 61, 6p. tables.
(Contract NObs-84025)
Unclassified report

DESCRIPTORS: *Elastomers, *Ethylenes, *Propenes, *Butyl rubber, *Polymers, Carbon black, Reinforcing materials, *Antioxidants, *Oxidation inhibitors, Oxides, Antimony compounds, *Heat resistant polymers, Air, Hydrocarbons, Chlorides, Oxidation, Aging, Radiation damage, Steam, Water, Sulfides, Iron, Copper, Gamma rays, *Urethanes, Additives, Materials, Absorption.

Aging studies and the effectiveness of antioxidants for elastomers are discussed. Cumene oxidation indicates antimony oxide and chlorinated paraffins protect materials by altering the path of oxidation. Ethylene propylene copolymer can be protected with Hypalon 40 and antimony sulfide; polyurethanes are not protected by Sb203 and chlorinated paraffins. Aging of protected polyethylene in a mild gamma field at 450 F in air causes severe degradation. Steam and water aging of materials containing Sb203 and Hypalon absorb sizeable amounts of water. Materials protected with Sb203 and chlorinated paraffins should not be employed in contact with Fe or Cu, unless air is precluded from the area of contact; these metals reduce the level of protection.

AD-259 110 Div. 14
(6 July 61) OTS price $1.10

Army Prosthetics Research Lab., Walter Reed Army Medical Center, Washington, D. C.
ACRYLATE GLOVE-DIPPING MOLD.
by Victor T. Riblett and Charles S. Lamb. 1960, 2p. illus. (Technical rept. no. 6035)
Unclassified report

DESCRIPTORS: *Gloves, *Plastics, *Casting, Acrylic resins, Epoxy resins, Vinyl chlorides, Polymers, *Prosthetics.

Research was undertaken on a simplified method for fabricating acrylate cosmetic glove-dipping molds. Acrylate glove dipping molds were made by first reversing a polyvinyl chloride glove, fitting it to a foam filler mandrel, and casting a split stone mold matrix (Hydrocal) around it to prevent the glove from deforming when the final mold was made. The mandrel was removed from the stone mold and the PVC glove removed from the foam filler mandrel and fitted in the stone mold. Epoxy resin was then poured into the reversed glove to obtain a positive mold, which was modified to correct what appeared to be deformities. The method not only entails considerable time, but requires that the technician be skilled in this art in order to obtain a useable mold. However, the greatest fault with a mold of this type is that it attempts to correct deformities which should be present. When the reversed glove is fitted to a foam mandrel these deformities are not eliminated, but exaggerated and multiplied. When the modified mandrel is dipped in latex to form a glove and the glove removed and reversed, these deformities become apparent. Fingernails are distorted and the fingers appear to be foreshortened. (Author)

AD-259 188 Div. 14
(11 July 61) OTS price $1.00

Carborundum Co., Niagara Falls, N. Y.
CONTINUOUS FILAMENT CERAMIC FIBER.
Rept. 15 Mar-15 Sep 60 on Fibrous Materials for Decelerators and Structures.
by Edward H. Girard. Feb 61, 25p. incl. illus. table.
(Contract AF 33(616)6246, Proj. 7320)
(WADD TR 60-244, pt. 2) Unclassified report

DESCRIPTORS: *Ceramic fibers, *Filaments, *Glass textiles, Refractory materials, Ceramic materials, Fibers, Melting, Physical properties, Crucibles, Drawing (Machine processing), Tensile properties, Processing, Niobium compounds, Borides.

A number of refractory materials were examined to determine their possible usefulness as materials for crucibles for melting, fining, and drawing high-silica glass compositions. NbB2 gave the most promising results of the materials examined. Time and temperature relationships as well as variations in bath composition were investigated in an effort to improve premelt characteristics. The addition of V205 was particularly effective. It had been conceived that a well-fined premelt should be a better starting material for fiber drawing than an unreacted batch composition. Fiber drawing studies, however, showed no improvement in either the drawing characteristics or in the physical characteristics of fiber when well-fined premelt was used. (Author)

AD-259 230 Div. 14, 26, 11
(11 July 61) OTS price $5.60

International Business Machines Corp., San Jose, Calif.
ANALYSIS AND DESIGN OF EXTERNALLY PRESSURIZED GAS BEARINGS.
Research rept.,
by I. C. Tang and W. A. Gross. 17 Apr 61, 51p. incl. illus. 20 refs. (Rept. no. RJ-191)
(Contract Nonr-344800, Proj. NR 061-120)
Unclassified report

DESCRIPTORS: *Gas bearings, *Thrust bearings, *Journal bearings, Design, Mathematical analysis, Pressure, Lubrication, Temperature.

Equations for flow rate, pressure, load, and stiffness of externally pressurized thrust and journal bearings are given for purely viscous isothermal gas films with longitudinal and radial flow and no relative surface motion. Charts are presented by means of which the bearing characteristics can be evaluated in terms of the bearing configuration, the ratio of supply to ambient pressure, and a bearing parameter. Sample characteristics of thrust and journal bearings are established using the curves, and experimental confirmation shown. A method of treating bearing films with two inlet-restricting orifices in series is described. (Author)

AD-259 232 Div. 14, 25
(27 June 61) OTS price $1.60

General Ceramics Div., Indiana General Corp., Keasbey, N. J.
OXIDE THERMOELECTRIC MATERIALS,
Bi-monthly progress rept. no. 6, 2 Dec 60-2 Feb 61,
2 Feb 61, 7p. incl. tables.
(Contract NObs-78414)
Unclassified report

DESCRIPTORS: *Thermoelectricity, Oxides, Resistance, *Ceramic materials, Tests, Test equipment, Temperature, Electrical properties, Zinc compounds, Aluminum compounds, Tin compounds, Antimony compounds, Titanium compounds, Vanadium compounds, Indium compounds, Power supplies.

Research was continued on Seebeck coefficient and dc resistivity measurements of oxide thermoelectric materials. Raw materials investigated were: (1) zinc oxide, (2) alumina, (3) tin oxide, (4) antinionic oxide, (5) titanium dioxide, (6) vanadium pentoxide, and (7) indium oxide. (Author)

AD-259 269 Div. 14, 17
(11 July 61) OTS price $2.25

American Machine and Foundry Co., Alexandria, Va.
ELECTROPLATED CERMET COATINGS FOR OXIDATION PROTECTION OF SUBSTRATES IN EXCESS OF 2000 F.
Summary technical rept. 1 Nov 59-31 Oct 60, on Finishes and Materials Preservation,
by James C. Withers, Jan 61, 75p. incl. illus. tables.
(Contract AF 33(616)6807, Proj. 7312)
(WADD TR 60-718) Unclassified report

DESCRIPTORS: *Cermets, Electroplating, *Electroplated materials, Refractory coatings, *Refractory materials, Ceramic materials, Electrophoresis, Oxidation inhibitors, Coatings, Adhesion, Porosity, Stresses, Physical properties, Tests.

A method was developed for electrodepositing cermet deposits of Ni, Cr, Pt, Ph, and Co-W and Al2O3, ZrO2, SiO2, and MoSi2. Deposits of these cermets were oxidation tested at 2000 and 2500 F. Those cermets showing less weight change than the pure electroplated metal were plated on Mo and tested at the test temperature. A Ni-ZrO2 cermet coating 5 mils thick protected Mo for 468 hr at 2000 F. A Cr-ZrO2 cermet protected Mo for 2 hr and 20 min at 2500 F, while a Ni-SiO2 cermet protected Mo for greater than 5 hr at 2500 F. (Author)

AD-259 329 Div. 14
(10 July 61) OTS price $1.60

Material Labs., Puget Sound Naval Shipyard, Bremerton, Wash.
MARINE LAMINATING PROPERTIES OF SELECTED WOOD SPECIES: OUTDOOR EXPOSURE, SECOND PERIOD EXAMINATION,
by E. Stahl. June 61, 7p. incl. illus. tables.
(Evaluation rept. no. E-412-L1)
Unclassified report

DESCRIPTORS: *Wood, *Laminates, Adhesives, Resorcinal, Tests, Phenols, Climatic factors.

Outdoor weathering exposure evaluations of delamination developed in approximately one year in laminated beams of eleven domestic and foreign wood species indicate a general slight increase over the initial exposure period. Laminated teak is an exception in that delamination has been progressive over the period. (Author)

AD-259 419 Div. 14, 16
(12 July 61) OTS price $1.60

Army Prosthetics Research Lab., Walter Reed Army Medical Center, Washington, D. C.
EFFECT OF CATALYST CONCENTRATIONS ON THE STAIN RESISTANCE OF PLASTICIZED POLYVINYL CHLORIDE MATERIALS,
by James T. Hill. May 61, 10p. incl. tables.
(Technical rept. no. 6107)
Unclassified report

DESCRIPTORS: *Plastics, Polymers, *Vinyl chlorides, *Catalysts, Polymerization, Discoloration, Mechanical properties, Stresses, Elasticity, Tensile properties, Cumenes, *Peroxides, Films, *Gloves, *Prosthetics, Materials, *Plastic coatings.

The effect on stain resistance and physical properties of catalyst concentrations in two plasticized poly- (vinyl) chloride formulations is described. Concentrations of catalyst ranged from 1.67 to 3.0%. Stain resistance was increased in both formulations with an increase in catalyst concentration. The effect on physical properties was minimal. (Author)

AD-259 420 Div. 14
(12 July 61) OTS price $1.10

Army Prosthetics Research Lab., Walter Reed Army Medical Center, Washington, D. C.
HARDNESS OF EPOXY RESINS BY THE H-H HARDNESS METHOD,
by John W. Hodge, Jr. May 61, 9p. incl. illus. tables (Technical rept. no. 6108)
Unclassified report

DESCRIPTORS: *Epoxy resins, *Resins, Test equipment, *Plastics, Amides, Polymers, Hardness, Measurement, Mechanical properties, Test methods.

Using the H-H method, a resin composition of Epon 15-Versamid 140 was evaluated to determine the effects of Versamid 140 on the hardness of the cured resins. It was found that compositions containing 60, 65, and 70% Versamid 140 had hardnesses, in terms of mean penetrating loads, of 154.8, 81.9, and 1.50 lb, respectively. Eighty percent Versamid 140 and above in complete cured resin samples were obtained. Maximum hardness of 75 on the Barcol Tester was obtained in a composition of 70/30 Epon 815/Versamid 140. (Author)

# Division 14 - MATERIALS (NON-METALLIC)

AD-259 431 Div. 14, 1, 4
(14 July 61) OTS price $6.60

National Cash Register Co., Dayton, Ohio.
DEVELOPMENT OF A REVERSIBLE-COLOR COATING FOR AIRCRAFT CAMOUFLAGE.
Quarterly rept. no. 3, 7 Dec 60-7 Mar 61, by George J. Collins. 7 Mar 61, 59p. incl. illus. tables.
(Contract NOa(s) 60-6104-c)
Unclassified report

Original contains color plates; all ASTIA reproductions will be in black and white. Original may be seen in ASTIA Headquarters.

DESCRIPTORS: Aircraft, *Camouflage, *Camouflage paints, *Aircraft finishes, Colors, Photochemical reactions, *Dyes, Resins, Stability, Temperature, Photosensitivity, Test methods, Organic solvents, *Pigments, Selection, Climatic factors, *Coatings, Life expectancy, Specifications, Solvent action, Metalorganic compounds.

Formulation variables that affect Weatherometer durability, and formulating photochromic overcoatings for the present aircraft finishes were studied. Several overcoating formulations appear acceptable, but will have restricted operational life due to the limited light stability of the dyes. The efforts to improve dye performance led to the concept of converting the dyes to photochromic pigments which appear to offer many advantages over the technique of solvating the dye in the coating vehicle. (Author)

AD-259 544 Div. 14
(14 July 61) OTS price $1.10

Narmco Industries, Inc., San Diego, Calif.
POTENTIAL OF FILAMENT WOUND COMPOSITES.
Monthly progress rept. no. 4, 1-30 June 61, by W. H. Otto, B. Duft, and S. Dharmarajan. June 61, 6p. incl. illus. table.
(Contract NOw-61-0623-c)
Unclassified report

DESCRIPTORS: *Filament wound construction, Glass textiles, Resins, Laminates, Glass, Stresses, Mechanical properties, Tensile properties, Reinforcing materials, Theory, Mathematical analysis, Algebra, Fracture (Mechanics), Fibers, Epoxy resins.

Expressions are derived for computing stresses at the interlamination. These are based on certain simplifying assumptions regarding the elastic constants for a laminate made up of two laminations, oriented at different angles with respect to the principal axis of the laminate. (Author)

AD-259 552 Div. 14
(14 July 61) OTS price $.75

Rock Island Arsenal Lab., Ill.
DEVELOPMENT OF A GEL-RESISTANT PRESERVATIVE OIL.
Technical rept.
by R. LeMar. 10 Mar 61, 26p. incl. tables (Rept. no. 61-999)
Unclassified report

DESCRIPTORS: Gels, Resistance, *Oils, Amines, Fatty acids, Corrosion inhibition, Humidity cabinets, Ultraviolet radiation, Viscosity, Stability, Oleic acids, Waxes, Design, Tests, *Fatty acid esters, Lanolin, Alcohols, Machine tools, *Lubricant additives, Preservation.

Gel test methods were modified to more precisely discern thickening tendencies in these oils. In order to determine the cause of the thickening of the 42a blend, studies were carried out on a series of blends, wherein systematic changes were made in concentrations of certain additives suspected of causing this thickening. It was found that three of the additives used in the above blend contributed to oil thickening. These were the fatty amine oleate, oleic acid and microcrystalline way. A combination consisting of lanolin and alcohol improved the gel-resistance of the oil blend. Corrosion resistance tests were carried out on these new blends to determine the effect of formulation changes upon this property. The humidity cabinet-ultraviolet light protection potential of this type of blend was lowered slightly by additive changes designed to improve the viscosity stability. (Author)

AD-259 557 Div. 14
(14 July 61) OTS price $1.10

Rock Island Arsenal Lab., Ill.
THE EFFECTS OF A SIMULATED SPACE ENVIRONMENT ON THE PROPERTIES OF ELASTOMERS.
by Z. T. Ossefort and J. D. Ruby. 15 May 61, 11p. incl. illus. tables (Rept. no. 61-1999)
Unclassified report

Published in the Proceedings of the Fifth National Meeting, Institute of Environmental Sciences, held on 6-7 April 1961 at Washington, D. C.

DESCRIPTORS: *Elastomers, Space environmental conditions, Simulation, Physical properties, Mechanical properties, Low pressure research, High temperature research, Low temperature research, Solar energy, Cosmic rays, Ablation, Cratering, *Vulcanizates, Plasticizers, Ozone, *Synthetic rubber.

The principle factors of concern in space environmental (in so far as effects on materials are concerned) are believed to be: (1) extremely high (approaching absolute) vacuum, (2) exposure to high and low temperatures, (3) actinic solar radiation, (4) other forms of high energy radiation such as cosmic radiation undiminished by atmospheric penetration, and (5) particle bombardment from tiny meteorites. Initial studies on elastomers (for sealing members in these systems) were made in a temperature range up to 800 F while exposed to pressures in the range from 10 to the -5th to 10 to the -6th power mm of Hg. One of the most striking conclusions to be made is the stability of organic materials when subjected to these low pressures. Only very small losses of material were observed and these were almost completely due to known volatile constituents. (Author)

AD-259 583 Div. 14, 4
(14 July 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
INVESTIGATION OF THERMAL DESTRUCTION OF CONDENSATION RESINS. THERMAL DESTRUCTION OF SOLIDIFIED EPOXY RESINS,
by M. B. Neyman, B. M. Kovarskaya and others. 22 Mar 61, 11p. incl. illus. tables (Trans. no. MCL-850 of Plasticheskiye Massy 7:17-20, 1960)
Unclassified report

DESCRIPTORS: *Epoxy resins, Decomposition, *Pyrolysis, Chromatographic analysis, Ethyl radicals, Amines, Carboxylic acids, *Heat resistant polymers, Hardening, Polymers, High temperature research, *Epoxides, *Resins, Reaction kinetics, Plastics, USSR.

Unhardened epoxy resins are decomposed in the absence of oxygen at temperatures upward of 200 - 250 degrees. The thermal decomposition is followed by separation of liquid products. It is demonstrated that the destruction products of hardened and unhardened resins contain, on the thermal disintegration, CO, CO2, methane, ethylene, propylene, etc, as well as saturated and unsaturated aldehydes. The mechanism of disintegration of resins, hardened by polyethylene-polyamine (PEPA) and maleic anhydride constitutes in both cases a radical process, beginning with break-away and disintegration of epoxy groups. As a result of decomposition of the remnant of maleic anhydride great quantities of CO and CO2 are produced on decomposition of the epoxy resin hardened by maleic anhydride. The epoxy resin, hardened by PEPA, decomposes more easily than the resin hardened by maleic anhydride; at the same time, more low-molecular products are formed. (Author)

AD-259 755 Div. 14, 12, 27
(25 July 61) OTS price $1.10

Bendix Products Div., Bendix Corp., South Bend, Ind.
SERVICES TO GENERATE BASIC ENGINEERING DATA ON THE BEHAVIOR OF PLASTIC COMPOSITE STRUCTURES UNDER VARIOUS CONDITIONS OF STRESS.
Monthly progress rept. no. 4, 1-30 June 61, by F. P. Wildy. 30 June 61, 3p.
(Contract NOw 61-0488-c)
Unclassified report

DESCRIPTORS: *Plastics, Glass textiles, Pressure vessels, Resins, Structures, Tests, Stresses, *Rocket cases, Rocket motors, Pressure, Materials, Reinforcing materials, Hydrostatic pressure.

Additional D-ring tests were conducted on prepreg tapes from yarn, and an additional four 7-in. cases were fabricated. Four 7-in.-diam pressure vessels were hydrotested. Failure occurred in each case at pressures of 1355 to 2040 psi at or near the point of tangency between the end dome and the cylindrical section.

AD-259 819 Div. 14, 31
(19 July 61) OTS price $1.10

Material Lab., New York Naval Shipyard, Brooklyn.
SILICONE COMPOUND 23, MANUFACTURED BY THE DOW CORNING CORPORATION, MIDLAND, MICHIGAN: INVESTIGATION OF, FOR USE IN AN ICE-PHOBIC DEICING SYSTEM.
Progress rept. no. 3, 18 July 61, 18 July 61, 7p. incl. illus. tables.
(Lab. proj. 5743-67)
Unclassified report

DESCRIPTORS: *De-icing materials, *Silicone resins, Silicones, *De-icing systems, Coatings, Ice, Adhesion, Ships, Tests, Paint primers, Paints, Preparation.

Ice-phobic characteristics of the deicing system comprising the Navy gray deck paint system, an A4014 primer with the Compound 23 was investigated. For a material to be considered ice-phobic, the values for ice adhesion should remain below 15 psi for 10 repeated ice releases with water immersion between successive releases. Results of ice adhesion tests on samples of 24 different production lots of Compound 23 yielded ice-adhesion values in the ice-phobic range on the first test; none of the lots maintained its ice-phobicity upon repeated test cycling. Determination of the ice adhesion of this compound appears to give an extremely sensitive indication of minute differences which may be inherent in the preparation of polysiloxanes.

AD-259 833 Div. 14, 11
(18 July 61) OTS price $3.60

Aberdeen Proving Ground, Md.
EVALUATION TEST OF ANTISEIZE COMPOUND FOR TANK AND VEHICLE APPLICATION,
by John F. Crox, Jr. July 61, 1v. incl. illus. tables (Rept. no. DPS-252)
Unclassified report

DESCRIPTORS: *Antiseize compounds, Tanks, Armored vehicles, Tracked vehicles, *Lubricants, Lubrication, Surfaces, Polymers, Ethylenes, Fluorides, Tests, Materials, Chromates, Zinc compounds.

Two antiseize compounds (Detroit Arsenal-Franklin Institute) were received at Aberdeen Proving Ground for testing to determine if they were capable of assisting in the ease of disassembly of mating steel parts, of preventing seizure and corrosion, and of supplying a measure of lubrication. The base stock of both the F.I.L. 15-13-2 and F.I.L. 15-13-2A antiseize compounds contains teflon and zinc chromate. The diluent for both is methyl isobutyl ketone. CONCLUSIONS: Both experimental antiseize compounds have a tendency to cause close-fitting mating parts to bind (such as torsion bar serrated end in road wheel arm assembly). Both antiseize compounds have a tendency to flake off mating surfaces that are under load (e.g., track pins) with a resultant formation of corrosion. Present preservatives and lubricants used are more effective chemical agents in preventing corrosion than the antiseize compounds tested. Mating surface treated with the test antizeize compounds are generally more difficult to separate than mating surfaces assembled dry. (Author)

## 15. MATHEMATICS

AD-259 085 Div. 15
(6 July 61) OTS price $2.60

Purdue Research Foundation, Lafayette, Ind.
COMMUTATORS, PERTURBATIONS, AND UNITARY SPECTRA.
Technical note no. 14 on Commutators on a Hilbert Space,
by C. R. Putnam. June 61, 25p. (PRF rept. no. 1421)
(Contract AF 18(603)139)
(AFOSR TN 60-1450) Unclassified report

# Division 15 - MATHEMATICS

DESCRIPTORS: *Perturbation theory, Functional analysis, Topology, *Operators (Mathematics), Quantum mechanics, Algebras, Matrix algebra, Measure theory.

Let A and B denote linear operators, bounded or unbounded, on a Hilbert space H of elements x. Let $\|x\| = (x,x)^{1/2}$ and put $A = \sup \|Ax\|$ where $\|x\| = 1$. If A and B are bounded and if C denotes the commutator of A and B,

(1.1) $C = AB - BA$,

then it is well known that

(1.2) $\|C\| \leq 2\|A\|\|B\|$,

and that the inequality cannot be improved by replacing the 2 by $2 - \epsilon$ with $\epsilon > 0$. Simple examples with finite matrices $A \neq 0$, $B \neq 0$ and A, iB (hence also C) even self-adjoint show that the equality of (1.2) may hold. Part I concerns an improvement of (1.2) when B is bounded but otherwise arbitrary, A and C are bounded and self-adjoint, and C is non-negative. In Part II a related problem is considered concerning perturbations of a self-adjoint operator A. In Part III applications are given of the results of Part II to semi-normal operators, Laurent matrices, measure preserving transformations, and to what correspond to certain operators occurring in scattering theory in quantum mechanics. (Author)

AD-259 115 Div. 15
(6 July 61) OTS price $2.60

Washington U., Seattle
GROUPS ACTING ON THE 4-SPHERE,
by Roger W. Richardson, Jr. 19 Apr 61, 23p.
(Technical rept. no. 11)
(Contract Nonr-47715, Proj. NR 043 186)
Unclassified report

DESCRIPTORS: *Groups (Mathematics), *Topology, Transformations (Mathematics).

AD-259 135 Div. 15
(7 July 61) OTS price $3.60

Michigan U. Coll. of Literature, Science, and the Arts, Ann Arbor.
REGULAR CONVERGENCE IN A PARACOMPACT SPACE,
J. H. Stoddard. May 61, 34p. (Rept. no. 03597-3-T)
(Contract AF 49(638)774)
(AFOSR-798) Unclassified report

DESCRIPTORS: *Topology, *Algebraic topology, *Sequences, Mathematics.

The main results are systemized concerning n-regular convergence by using a uniform method and placing them in the framework of a general, possible non-metrizable, paracompact topological space. (Author)

AD-259 136 Div. 15
(7 July 61) OTS price $1.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
ON THE ZEROS OF ANALYTIC FUNCTIONS,
by Leon Kotin. May 61, 8p. (ASRDL Technical rept. no. 2206)
Unclassified report

DESCRIPTORS: *Applied mathematics, Series, *Functional analysis, Complex variables, Mathematics.

By the use of Rouche's Theorem, the zeros of analytic functions, expressed as power series, can be located with respect to certain circles. The same technique yields zero-free circular and annular regions. Finally, an application to the coefficients of univalent functions is derived. (Author)

AD-259 146 Div. 15
(7 July 61) OTS price $13.00

Applied Mathematics and Statistics Labs., Stanford U., Calif.
CONNECTIONS AND CONFORMAL MAPPING
by M. Schiffer and N. S. Hawley. 8 May 61, 181p. 31 refs. (Technical rept. no. 94)
(Contract Nonr-22511, Proj. NR 041-086)
Unclassified report

DESCRIPTORS: *Conformal mapping, Mathematics, Integral equations, Green's function, Functions, *Algebraic geometry, Partial differential equations, Potential theory, *Transformations (Mathematics), Complex variables, Algebraic topology, Calculus of variations.

Contents:
The integral equation for circular mapping
Variational theory for moduli
Connections on plane domains
Variational theory for connections
Connections on closed Riemann surfaces
Variation of connections on Riemann surfaces

AD-259 147 Div. 15
(7 July 61) OTS price $5.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
ON TWO DIMENSIONAL VARIATIONAL PROBLEMS IN PARAMETRIC FORM,
by H. B. Jenkins. 15 May 61, 56p. (Technical rept. no. 95)
(Contract Nonr-22511, Proj. NR 041-086)
Unclassified report

DESCRIPTORS: Mathematics, *Conformal mapping, *Partial differential equations, Functions, Transformations (Mathematics), Matrix algebra, Inequalities.

The geometrical relationships between a closed surface and a solution surface are studied. The mapping of a solution surface S, into a closed surface in the case of regular variational problems gives rise to a canonical mapping of S onto the solution of a non-parametric, uniformly elliptic variational problem. The principal application is to show that solutions of some variational problems behave qualitatively like minimal surfaces, in the same sense that solutions of uniformly elliptic equations behave like solutions of the Laplace equation. (Author)

AD-259 148 Div. 15
(7 July 61) OTS price $8.60

Applied Mathematics and Statistics Labs., Stanford U. Calif.
SCHAUDER ESTIMATES UNDER INCOMPLETE HOLDER

CONTINUITY ASSUMPTIONS,
by Paul Fife. 5 June 61, 94p. (Technical rept. no. 96)
(Contract Nonr-22511, Proj. nr. 041-086)
Unclassified report

DESCRIPTORS: *Differential equations, *Integral equations, *Partial differential equations, Functions, Polynomials, Operators (Mathematics), Inequalities, Mathematics.

The possibility of obtaining a priori pointwise estimates involving Holder difference quotients is explored with respect to some of the independent variables. The first step is the derivation of certain potential theoretic results. These are applied to functions given by convolutions with a fundamental solution to an elliptic operator as kernel, and to solutions of the basic boundary value problem with compact support when the operators have constant coefficients and the domain is a half-space. The results are extended to a class of problems with variable coefficients and domains with curved boundaries. (Author)

AD-259 192 Div. 15
(11 July 61) OTS price $6.60

California U., Berkeley.
ON DIFFERENTIAL EQUATIONS CONTAINING A SMALL PARAMETER,
by Jack K. Hale. Sep 60, 64p. 26 refs. (Technical rept. no. 6)
(Contract Nonr-22260, Proj. NR 041-221)
Unclassified report

DESCRIPTORS: *Differential equations, Linear systems, Nonlinear systems, Nonlinear differential equations, Numerical analysis, Matrix algebra.

A series of papers was written developing a method of successive approximations for the determination of existence theorems for periodic solutions of weakly nonlinear differential systems and for the determination of boundedness theorems for linear periodic differential systems. With the development for this particular class of problems nearing completion, a unified treatment is given of the solution. (Author)

AD-259 270 Div. 15
(11 July 61) OTS price $7.60

Brown U. Div. of Applied Mathematics, Providence, R. I.
SOME FURTHER RESULTS ON FUNCTIONS OF MARKOV PROCESSES,
by J. Hachigian and M. Rosenblatt. May 60, 73p.
(Contract Nonr-56229, Proj. NR-042-217)
Unclassified report

DESCRIPTORS: *Statistical processes, *Probability, Measure theory, Special functions, Matrix algebra, Statistical functions.

An attempt is made to determine to what extent the validity of the Chapman-Kolmogorov equations implies that a process is Markovian. Results are given directly in terms of functions of Markov processes (chains), and not in terms of the Chapman-Kolmogorov equations and their implication. (Author)

AD-259 271 Div. 15
(11 July 61) OTS price $1.10

Brown U. Div. of Applied Mathematics, Providence, R. I.
IDEMPOTENT MEASURES ON A COMPACT TOPOLOGICAL SEMIGROUP,
by M. Rosenblatt. June 61, 7p. (Technical rept. no. 3)
(Contract Nonr-56229, Proj. NR-042-217)
Unclassified report

DESCRIPTORS: *Measure theory, *Topology, Groups (Mathematics), Probability, Sequences.

AD-259 314 Div. 15
(11 July 61) OTS price $1.10

Institute of Tech., U. of Minn., Minneapolis.
STRONG CONVERGENCE IN A PRODUCT SPACE,
by James Serrin. 10 June 61, 6p.
(Contract AF 49(638)262)
(AFOSR-591) Unclassified report

DESCRIPTORS: *Measure theory, *Functional analysis, Functions, Sequences, Inequalities, Integration.

AD-259 324 Div. 15
(10 July 61) OTS price $9.10

Lockheed Aircraft Corp., Sunnyvale, Calif.
TABLES OF THE INTEGRAL OF THE ELLIPTICAL BIVARIATE NORMAL DISTRIBUTION OVER OFFSET CIRCLES,
by G. W. Rosenthal and J. J. Rodden. 1 May 61, 92p. incl. illus. tables (Rept. no. LMSD-800619)
(Contract NOrd-17017)
Unclassified report

DESCRIPTORS: Statistical analysis, *Distribution theory, *Mathematical prediction, *Probability, Integrals, *Statistical distribution, Tables.

Tables give the probabilities of being inside various circles not about the mean from a bivariate normal distribution having unequal variances. The range of the tables includes values of the mean up to three times the standard deviation. (Author)

AD-259 493 Div. 15, 25
(14 July 61) OTS price $1.60

Massachusetts Inst. of Tech., Cambridge.
RANDOM VIBRATION OF SYSTEMS WITH NONLINEAR RESTORING FORCES,
by Stephen H. Crandall. June 61, 15p.
(Contract AF 49(638)564)
(AFOSR-708) Unclassified report

DESCRIPTORS: *Vibration, Damping, Non-linear systems, *Statistical analysis, Differential equations, Partial differential equations, Integration.

Two procedures are discussed for studying the response of nonlinear systems to random excitation. The Fokker-Planck method is potentially applicable to a wide class of problems but the

integrations required have only been effected in a few special cases. The equivalent linearization method is easy to carry out but is limited to small nonlinearities. It is demonstrated that to first order in the nonlinearity the equivalent linearization estimate of mean square stationary response is identical with that provided by the Fokker-Planck equation. A new equivalent linearization procedure for estimating the expected frequency of zero crossings in the random response is described and shown to give the same result as the Fokker-Planck equation. (Author)

AD-259 513 Div. 15
(13 July 61) OTS price $8.10

Educational Research Corp., Cambridge, Mass.
ON STATISTICAL TESTS OF GROUP DIFFERENCES,
by Phillip J. Rulon and W. Douglas Brooks.
24 Apr 61, 66p. incl. tables.
(Contract N61339-294)
(NAVTRADEVCEN 294-3) Unclassified report

DESCRIPTORS: *Statistical tests, Matrix algebra, Real variables, Analysis of variance.

AD-259 568 Div. 15
(14 July 61) OTS price $1.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
ON ENTIRE FUNCTIONS AND A FOURIER INTEGRAL PROBLEM,
by J. A. Sheehan. 5 July 61, 15p. (Rept. no. 416-0011)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: *Integral transforms, Functions, Integral equations, Polynomials.

Some previous work of Akutowicz on the following problem is given: that $\phi(x)$, ($\phi \in L^2$), is null outside some finite interval, what can be said about $\phi$, if it is known that its Fourier transform, $\hat{\phi}$, satisfies $|\hat{\phi}(x)| = a(x)$, where $a(x)$ is some fixed function? In some cases, the the question yields easily if we consider $[a(x)]^2$, which is readily seen to be continuable as a function of exponential type. Specifically, if $\phi \in L^p$, ($p \geq 2$), the problem is tractable in the sense that it always has a solution (subject to simple conditions on $a(x)$, and the totality of solutions $\phi_K(x)$ can be displayed, not directly, but through their Fourier transforms, $\hat{\phi}_K(x)$. If, on the other hand, $\phi \in L^p$, ($1 \leq p < 2$), existence conditions which involve only $a(x)$ do not appear, and we find it necessary to augment the hypotheses. Even with augmented hypotheses, the conclusions are substantially weaker than in the case $p \geq 2$. (Author)

AD-259 602 Div. 15
(14 July 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
OPTIMAL PROCESSES OF CONTROL (Optimalniye Protsyessi Regulirovaniya),
by L. S. Pontryagin. Apr 60, 28p. (Trans. no. MCL-491 of Uspekhi Matematicheskikh Nauk 14:3-20, 1959)
Unclassified report

DESCRIPTORS: *Control systems, *Linear systems, Mathematical analysis, Topology, Differential equations, Integral equations, Vector analysis, *Calculus of variations, Functions, Operators (Mathematics).

AD-259 645 Div. 15, 30
(17 July 61) OTS price $2.60

Columbia U., New York.
THE TIME DEPENDENCE OF A SINGLE-SERVER QUEUE WITH POISSON INPUT AND GENERAL SERVICE TIME,
by Lajos Takacs. 29 June 61, 20p. (Rept. no. CU-26-61-Nonr-266(59) NS)
(Contract Nonr-26659, Proj. NR 042-205)
Unclassified report

DESCRIPTORS: Cybernetics, Control systems, *Probability, Statistical distributions, *Statistical processes, Differential equations, Integral equations, Combinatorial analysis, *Operations research.

AD-259 669 Div. 15
(17 July 61) OTS price $2.60

Midwest Research Inst., Kansas City, Mo.
ON THE APPROXIMATE INVERSION OF SOME LAPLACE TRANSFORMS.
Technical rept. for 1 May-31 Dec 60 on Mathematical Techniques of Aeromechanics,
by Yudell L. Luke. May 61, 19p. incl. illus. tables.
(Contract AF 33(616)7062, Proj. 7071)
(ARL-20) Unclassified report

DESCRIPTORS: *Integral transforms, Special functions, Bessel functions, Algebra, *Numerical analysis, Stresses, *Integral equations.

It is shown how to approximate a class of Laplace transforms, say A(p), which involve the ratio of sums of generalized hypergeometric functions. The latter transcendentals are approximated by rational functions (Luke, Y.L., Jour. Math. Phys. 38, 279-294, 1960). Thus A(p) is approximated by a rational function and inversion of the latter leads to simple and useful approximations for the inverse transform of A(p). For an application, a stress problem (Miklowitz, J., Jour. Appl. Mech. Ser. E, 27, 165-171, 1960) is studied, and the results manifest the simplicity and accuracy of our approximation technique. (Author)

AD-259 759 Div. 15
(19 July 61) OTS price $2.60

Columbia U., New York.
THE CHOICE OF THE DEGREE OF A POLYNOMIAL REGRES-

SION AS A MULTIPLE DECISION PROBLEM,
by T. W. Anderson. 2 Mar 61, 22p. (Rept. no. CU-50-61-Nonr-266(33) MS)
(Contract nos. Nonr-26633 and Nonr-327900, Proj. NR 042-034)

Unclassified report

DESCRIPTORS: *Statistical analysis, Polynomials, *Statistical distributions, Difference equations.

On the basis of a sample of observations, an investigator wants to determine the appropriate degree of a polynomial in the index, say time, to represent the regression of the observable variable. This multiple decision problem is formulated in terms used in the theory of testing hypotheses. Given the degree of polynomial regression, the probability of deciding a higher degree is specified and does not depend on what the actual polynomial is (except its degree). Within the class of procedures satisfying these conditions and symmetry (or two-sidedness) conditions, the probabilities of correct decisions are maximized. The optimal procedure is to test sequentially whether coefficients are 0, starting with the highest (specified) degree. The procedure holds for other linear regression functions when the independent variates are ordered. The problem and its solution can be generalized to the multivariate case and to other cases with a certain structure of sufficient statistics. (Author)

AD-259 760 Div. 15
(19 July 61) OTS price $1.60

Columbia U., New York.
A NOTE ON BEST UNBIASED ESTIMATES,
by T. W. Anderson. 16 Feb 61, 13p. (Rept. no. CU-49-61-Nonr-266(33)MS)
(Contracts Nonr-26633 and Nonr-327900, Proj. NR 042-034)

Unclassified report

DESCRIPTORS: *Statistical analysis, *Least squares method, Matrix algebra, Statistical distributions.

The Gauss-Markov theorem states that least squares estimates are best linear unbiased estimates. In this analysis the question is raised of the extent to which the qualification linear can be omitted from the statement of the theorem. (Author)

AD-259 771 Div. 15
(19 July 61) OTS price $1.10

Michigan U. Coll. of Literature, Science, and the Arts, Ann Arbor.
INSEPARABLE SETS AND REDUCIBILITY,
by S. Tennenbaum. July 61, 7p. (Rept. no. 03105-20-T)
(Contract Nonr-122421)

Unclassified report

DESCRIPTORS: *Mathematical logic, Functions, Number theory, *Mathematical computer data, *Algebra.

A construction of inseparable sets of a new type is presented. A rather curious application of these to the theory of machine reducibility is given as initiated by E. Post (Bull. Amer. Math. Soc., 50:281-316, (1944)). (Author)

AD-259 773 Div. 15, 25, 8
(19 July 61) OTS price $1.60

Institute of Mathematical Sciences, New York U., N. Y.
A NOTE ON THE EXPANSION COEFFICIENT OF GEOMETRICAL OPTICS,
by Morris Kline. 1961, 12p. (Research rept. no. EM-166)
(Contract AF 19(604)5238)

Unclassified report

DESCRIPTORS: *Optics, *Electromagnetic theory, *Differential geometry, Light, Electron optics, Series, Geometry.

The expansion coefficient of geometrical optics is a measure of the cross section of a tube of rays and has the physical significance of measuring the intensity of the light propagating along the tube. Strictly, it is a point concept and measures the intensity along an individual ray. This paper presents a convenient expression for the expansion coefficient. The mathematics involved is merely an application of known differential geometry but the expression derived seems to be new and is apparently unknown to workers in electromagnetic theory. The new feature of this paper is that the formula given for the variation of the expansion coefficient holds in inhomogeneous isotropic media and reduces immediately to the widely known expression for the expansion coefficient in homogeneous media, which involves the Gauss curvature of the wave front. (Author)

AD-259 776 Div. 15
(18 July 61) OTS price $6.60

Oslo U. (Norway).
TABLES OF RECIPROCAL POWERS OF INTEGERS AND VARIOUS INFINITE SUMS TO 55 DECIMALS,
by Egil A. Hylleraas and John Midtdal. 1961, 67p. incl. tables (Institute for Theoretical Physics (Physica Mathematica) rept. no. 8)
(Contract AF 61(052)134)
(ARL-92)

Unclassified report

DESCRIPTORS: *Functions, *Tables.

Contents:

Table I
$S_n - 1 = 2^{-n} + 3^{-n} + 4^{-n} + \ldots$
$1 - t_n = 2^{-n} - 3^{-n} + 4^{-n} - \ldots$
$s_n - 1 = 3^{-n} + 5^{-n} + 7^{-n} + \ldots$
$1 - T_n = 3^{-n} - 5^{-n} + 7^{-n} - \ldots$

Table II
$s_n - 1 - s_n(101)$
$s_n(101) = 101^{-n} + 103^{-n} + 105^{-n} + \ldots$
$1 - T_n + T_n(101)$
$T_n(101) = 101^{-n} - 103^{-n} + 105^{-n} - \ldots$

Table III
$x^{-n}$, $x = 3,5,7, \ldots,99$

Table IV
$2^{-n}$, $n = 1,2,3, \ldots,125$
$3^{-n}$, $5^{-n}$, $7^{-n}$, $n = 1,2,3, \ldots$

AD-259 794 Div. 15, 2, 25
(19 July 61) OTS price $3.60

Stanford Research Inst., Menlo Park, Calif.
FORCED OSCILLATIONS OF AN ELASTIC HALF-SPACE. Final rept.
by Carson Flammer, John R. Herndon, and Michael P. Stallybrass. 31 May 61, 39p. incl. illus. tables.
(Contract AF 19(604)6123)

Unclassified report

DESCRIPTORS: *Oscillation, Geophysics, Elasticity, *Transformations (Mathematics), Potential theory, Integral equations, Partial differential equations, Taylor's series, Functions, Continued fractions, *Numerical analysis, Equations, Disks, Deformation, Series, Programming, Mathematical computer data.

A series solution is obtained for the stress and deformation field generated in a homogeneous, isotropic, elastic half-space by means of a rigid disc attached to the surface and oscillating normal to it, a problem of interest in geophysics. The solution is exact to the extent that the amplitude factors in the series of spheroidal wave functions are determined by an infinite set of linear equations with complex coefficients. To obtain an approximate solution of this system of equations it was first necessary to prepare a program to extend the range of the tables of oblate spheroidal wave functions presently available, so that numerical values could be given to the coefficients appearing in these equations. This latter program and a program for the solution of a finite system of linear equations with complex coefficients are described. (Author)

AD-259 869 Div. 15
(21 July 61) OTS price $2.60

Columbia U., New York.
TESTS BASED ON THE MOVEMENTS IN AND THE COMOVEMENTS BETWEEN m-DEPENDENT TIME SERIES,
by Leo A. Goodman, June 61, 22p. incl. tables. (Rept. no. CU-55-61)
(Contract Nonr-26633, Proj. NR042-034)
Unclassified report

DESCRIPTORS: *Series, *Statistical tests, Statistical data, Analysis of variance, Statistical distribution.

Tests of the existence of correlation between the movements in two time series, which eliminate at least the primary effects of trends in the series, are presented in this article. A test of the existence of trend in a time series will also be presented here. (Author)

AD-259 870 Div. 15
(21 July 61) OTS price $2.60

Columbia U., New York.
FURTHER RESULTS IN THE THEORY OF NUMERICAL CONVERGENCE,
by Sigeiti Moriguti, 15 May 61, 24p. incl. illus. tables (Rept. no. CU-53-61)
(Contract Nonr-26633, Proj. NR 042-034)
Unclassified report

DESCRIPTORS: *Numerical methods and procedures, Sequences, Difference equations, Probability, Errors, Statistical distributions, Digital computers.

AD-259 871 Div. 15
(21 July 61) OTS price $10.10

Columbia U., New York.
ON TWO-STAGE SAMPLING PROCEDURES,
by Theodore K. Matthes. 7 Apr 61, 126p. incl. illus. (Rept. no. CU-51-61)
(Contract Nonr-26633, Proj. NR 042-034)
Unclassified report

DESCRIPTORS: *Sampling, Statistical analysis, Topology, Measure theory, Sequences, Analysis of variance, Sequential analysis.

The possibility of solving a given statistical problem even when sampling is permitted to be in two stages is investigated. Two-stage procedures are considered from the point of view of general decision theory in order to reduce their plenitude, and simplify their structure, by means of such principals as sufficiency and invariance. (Author)

AD-259 873 Div. 15, 32
(21 July 61) OTS price $4.60

Columbia U., New York.
STATISTICAL METHODS FOR THE MOVER-STAYER MODEL,
by Leo A. Goodman, June 61, 41p. incl. tables. (Rept. no. CU-54-61)
(Contract Nonr-26633, Proj. NR 042-034)
Unclassified report

DESCRIPTORS: *Probability, Matrix algebra, *Statistical analysis, Statistical tests, Population, Labor.

A study of the movement of workers among various industrial aggregates in the U.S. is given. The model assumes that each worker is either a mover or a stayer, that stayers do not move, and that the movement of movers can be described by a particular kind of probability process, a Markov chain. A study is given of the problems of estimating the parameters in this model and of testing various hypotheses concerning it. (Author)

AD-259 876 Div. 15
(21 July 61) OTS price $1.10

California U., Berkeley.
THE TORSION PONTRYAGIN CLASSES,
by Emery Thomas. June 61, 8p. (Technical rept. no. 20)
(Contract AF 49(638)79)
(AFOSR-668) Unclassified report

DESCRIPTORS: *Algebraic topology, Operators (Mathematics), Groups (Mathematics).

Torsion Pontryagin classes are expressed in terms of the standard characteristic classes of a real n-plane bundle over a paracompact space. The theorem contains three equivalent expressions for these classes.

AD-259 877 Div. 15
(21 July 61) OTS price $2.60

California U., Berkeley.
ON HOMOTOPY - COMMUTATIVITY,
by Ioan James and Emery Thomas. June 61, 23p. (Technical rept. no. 14)
(Contract AF 49(638)79)
(AFOSR TN 60-844) Unclassified report

DESCRIPTORS: *Groups (Mathematics), Algebras, *Algebraic topology.

A map of countable CW-complex into a topological group is discussed regarding its homotopy-commutative properties. Proofs are offered for six theorems with correlaries and lemmas.

AD-259 905 Div. 15
(24 July 61) OTS price $3.60

California U., Berkeley.
DIFFERENTIAL FORMS AND LIE ALGEBRA COHOMOLOGY FOR ALGEBRAIC LINEAR GROUPS,
by G. Hochschild and B. Kostant. June 61, 34p. (Technical rept. no. 19)
(Contract AF 49(638)79)
(AFOSR-681) Unclassified report

DESCRIPTORS: Groups (Mathematics), Algebras, Algebraic topology.

AD-259 907 Div. 15
(24 July 61) OTS price $2.60

California U., Berkeley.
ON FUNCTIONAL CUP-PRODUCTS AND THE TRANSGRESSION OPERATOR,
by Emery Thomas. June 61, 20p. (Technical rept. no. 23)
(Contract AF 49(638)79)
(AFOSR-910) Unclassified report

DESCRIPTORS: *Operators (Mathematics), Algebraic topology, Groups (Mathematics).

Let g be a map from a topological space X to a topological space Y. Suppose that X and Y are the total spaces of respective proper triads and that g is a triad map. It is then possible, in certain cases, to express the functional cup-product in terms of an ordinary cup-product. This is applied to obtain a classical result about the Hopf invariant and to obtain some new information about the cohomology rings of certain classifying spaces. (Author)

AD-259 916 Div. 15, 32
(24 July 61) OTS price $1.60

New York State Coll. of Agriculture, Cornell U., Ithaca.
MOMENT ESTIMATORS FOR THE PARAMETERS OF A MIXTURE OF TWO BINOMIAL DISTRIBUTIONS,
by Wallace R. Blischke. June 61, 14p. incl. tables (Technical rept. no. 5)
(Contract Nonr-40139, Proj. NR 042-212)
Unclassified report

DESCRIPTORS: *Statistical distributions, *Binomials, Statistical processes, Probability, Statistical functions, *Statistical analysis, Matrix algebra, Statistical tests.

The distribution of a chance variable Y is said to be a mixture of two binomial distributions if

$$P\{Y=y\} = \binom{n}{y}[\alpha p_1^y(1-p_1)^{n-y} + (1-\alpha)p_2^y(1-p_2)^{n-y}]$$

for y=0,1,..., or n=0, otherwise where $0<\alpha<1$, $0<p_1<p_2<1$ and $n \geq 3$ is integral. Estimators for $\alpha$, $p_1$, and $p_2$ are constructed on the basis of sample factorial moments computed on m observations from this distribution. The asymptotic joint distribution of the estimators and the asymptotic efficiency of the moment estimators relative to the maximum likelihood estimators are computed. The asymptotic efficiency is discussed as a function of the binomial parameter n. (Author)

AD-259 978 Div. 15
(21 July 61) OTS price $6.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
BOUNDS ON APSIDAL ANGLES.
Doctoral thesis,
by Frederick T. Metcalf. July 61, 58p. 14 refs.
(Technical note no. BN-250)
(Contract AF 49(638)228)
(AFOSR-967) Unclassified report

DESCRIPTORS: *Oscillation, Integrals, *Differential geometry, Bodies of revolution, Motion, *Rotation.

A new technique is developed for obtaining upper and lower bounds on the apsidal angle which occurs in certain problems of mechanics. The motion of a particle on a surface of revolution may be shown to take place between two horizontal planes cutting the surface. The particle moves periodically from one level to the other and then back again. As the particle moves from the lowest level of motion to the highest, the corresponding increase in the azimuth is called the apsidal angle. For the spherical pendulum the bounds which are derived constitute the well-known inequalities of Puiseux (1842) and Halphen. (1888). In the case of the heavy symmetrical top the bounds obtained by W. Kohn (Trans. Am. Math. Soc. 59:107-131, 1946) are derived. In both instances the advantage of this method is a simplification due to the elimination of the need for contour integration. This technique also permits new cases to be considered; namely, the motion of a particle on a paraboloid of revolution and on a spheroid. A result concerning motion on an arbitrary surface of revolution is also obtained. (Author)

# 16. MEDICAL SCIENCES

AD-259 054 Div. 16
(6 July 61) OTS price $1.10

Michigan State U., East Lansing.
(No Title).
Quarterly rept. no. 3,
by Ralph W. Lewis. 17 May 61, 3p. tables.
(Contract DA 18-064-404-cml-510)
Unclassified report

DESCRIPTORS: *Fungi, Plants, Production, Growth, *Parasites, Culture, *Culture media, Spores.

AD-259 072 Div. 16
(6 July 61) OTS price $1.60

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
THE EFFECT OF ACCLIMATIZATION TO COLD ON THE G TOLERANCE OF RATS,
by Elizabeth Reeves. 9 June 61, 14p. incl. illus. tables, 17 refs. (Rept. no. NADC-MA-6117)
(Task MR 005.15-0002.3; rept. no. 6)
Unclassified report

DESCRIPTORS: *Exposure, *Aviation medicine, Heart, Acceleration, Body weight, Adrenal glands, *Acceleration tolerance, Survival.

Two groups of rats were acclimatized to cold (4 to 6 C) for 37 days and then exposed to acceleration of 20 positive G until the heart rate decreased to 2 beats per second. No statistically significant difference in tolerance to acceleration was found between the cold-acclimatized animals and their controls. Exposure to cold caused loss of weight and increase in adrenal gland size. (Author)

AD-259 074 Div. 16
(6 July 61) OTS price $2.60

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
THE MEASUREMENT OF BIOCLIMATOLOGICAL HEAT EXCHANGE,
by Alice M. Stoll. 19 Apr 61, 24p. incl. illus. tables (Rept. no. NADC-MA-6108)
(Task MR005. 15-2002.1; rept. no. 24)
Unclassified report

DESCRIPTORS: *Radiation instruments, Temperature, Heat, Measurement, Design, Thermistors, Radiometers, Climate, Biology, *Ecology, *Thermal radiation, Wind, Velocity, Thermal stresses, Alaska, California, Heat transfer.

Investigation was undertaken to measure heat exchange between man and his environment. The radiant temperatures of both man and his surroundings and of any incident solar radiation were observed. The most recent instruments developed specifically to meet these needs are the wide range Thermistor Radiometer and the Panradiometer. The Thermistor Radiometer measures a wide range of environmental radiant temperature in extremes of normal occurring ambient temperature as well as skin temperature. The instrument is capable of an accuracy of + or - 0.05 C and has been used in ambients of -50 C to +30 C for the measurement of radiant temperatures within + or - 135 C of the ambient. The Panradiometer is constructed to measure the net heat exchange between man and his environment together with a description of the environment in terms of solar radiation, average radiant temperature of the surroundings in sun and in shade, and wind temperature and velocity, all in absolute physical units suitable for computations of the heat load on the individual. The design of this instrument is advantageous in that about 99% of the solar radiation lies at wavelengths less than 3 microns and about the same proportion of the radiation from man to his surroundings at wave-lengths longer than 4 microns. (Author)

AD-259 075 Div. 16
(6 July 61) OTS price $1.60

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
THE EFFECT OF AGEING ON THE G-TOLERANCE OF RATS,
by Elizabeth Reeves. 9 June 61, 10p. incl. illus. tables (Rept. no. NADC-MA-6116)
(Task MR005.15-0002.3; rept. no. 5)
Unclassified report

DESCRIPTORS: *Acceleration tolerance, Electrocardiography, *Age, Survival, Aviation medicine, Simulation, Gravity, Age factors.

The effect of age on the G tolerance of rats was studied in five different age groups - one, three, four, six, nine and twelve months. Each group consisted of 24 male Sprague-Dawley rats. All of the rats were subjected to 20 positive G and their survival times were measured using an EKG end point. The results show that there was a gradual decline in acceleration tolerance with increase of age in this group of 98 rats. (Author)

AD-259 077 Div. 16
(6 July 61) OTS price $2.60

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
ELECTRICAL ANALOG SIMULATION OF TEMPERATURE REGULATION IN MAN,
by R. J. Crosbie, J. D. Hardy, and E. Fessenden. 12 June 61, 21p. incl. illus. 11 refs. (Rept. no. NADC-MA-6130)
(Task MR005.15-2002.1; rept. no. 25)
Unclassified report

DESCRIPTORS: *Body temperature, Man, *Exposure, *Analog computers, *Exercise, Mathematical prediction, Shivering, *Metabolism, Blood vessels, Control, Experimental data, Simulation, Measurement, Vaporization, Dilation, Heat transfer.

Using the basic equations for heat balance which have been developed to take into account heat losses by radiation, convection and evaporation, an electrical analog has been constructed to simulate the physiological responses to heat and cold in the nude man. As has been previously shown, physiologic temperature regulation involves three of the basic types of control modes, namely, proportional control, rate control and some of the characteristics of on-off control. The rate and proportionality constants have been determined experimentally on the assumption that the regulated temperature is the average body temperature. Time constants for the various thermal changes can be determined from the thermal con-

stants of tissue and the response times of the physiological variables of sweating, vasomotor, activity and change in metabolic rate. The simulator predicts steady state situations of rectal temperature, skin temperature, metabolic rate, vasomotor state and evaporative heat loss under both resting conditions and exercise. Dynamic responses to sudden shifts in environmental temperature, air velocity, relative humidity and metabolic rate can be simulated to a considerable extent using equations based on the controls outlined above. (Author)

AD-259 098 Div. 16
(5 July 61) OTS price $1.10

Springfield Coll., Mass.
EFFECT OF TRAINING UPON REFLEX AND REACTION TIME,
by Dennis Gibson, Peter V. Karpovich, and Philip D. Gollnick. 28 June 61, 8p. incl. illus. tables.
(Contract DA 49-007-md-889)
Unclassified report

DESCRIPTORS: *Training, Physiology, *Reflexes, Reaction time.

AD-259 111 Div. 16, 30
(6 July 61) OTS price $1.10

Army Prosthetics Research Lab., Walter Reed Army Medical Center, Washington, D. C.
DESIGN MODIFICATION OF OWENS DEVIOMETER,
by Gunther A. Kramer. Jan 61, 1p. illus. (Technical rept. no. 6101)
Unclassified report

DESCRIPTORS: *Optical equipment, *Medical equipment, Eye, *Medical examination, Design, *Strabismus.

The purpose for the new design is to give an initial indication of the presence or absence of individual muscle abnormalities in the human eye. The prism cover test may be used along with the deviometer to determine the exact amount of heterotropia at each of the six cardinal positions of the eye. This information may be obtained by having the patient look at a suitable light source (one of the two lights of the rotating arm) from a prescribed distance and then moving the light or the patient's head in such a way that he is looking toward the right or left, up and down, and at the level of the rotating light in each position. (Author)

AD-259 112 Div. 16
(6 July 61) OTS price $1.10

Army Prosthetics Research Lab., Walter Reed Army Medical Center, Washington, D.C.
CHILD'S PREHENSION DEVICE, TWO-LOAD, METAL.
by Clarence Gillenwater. Feb 61, 4p. (Technical rept. no. 6102)
Unclassified report

DESCRIPTORS: *Artificial limbs, Children, *Hooks, *Arms, Torque, Design, Springs, Tests, Stresses, Prosthetics, Control, Clamps, Operation.

A child's two-load prehension device approximately the same size as the Dorrance 88X hook and having lyre-shaped fingers has been developed. Prototype models have been fabricated and the actuating mechanism subjected to preliminary tests. (Author)

AD-259 113 Div. 16
(6 July 61) OTS price $1.10

Army Prosthetics Research Lab., Walter Reed Army Medical Center, Washington, D. C.
VOLUNTARY OPENING HAND WITH FINGERTIP LOCK.
by Theodore J. Bushey. Mar 61, 1p. (Technical rept. no. 6106)
Unclassified report

DESCRIPTORS: *Artificial limbs, *Arms, Control, *Hooks, Design, Clamps, Prosthetics, Operation.

AD-259 158 Div. 16, 20, 28
(10 July 61) OTS price $8.60

Army Medical Research Lab., Fort Knox, Ky.
(No title).
Progress rept. 1 July 60-30 June 61.
30 July 61, 98p.
Unclassified report

DESCRIPTORS: *Biochemistry, *Physiology, *Stress (Physiology), *Radiobiology, Radiation effects, Blood, Body fluids, Arctic regions, Injuries, Steroids, Radiation injuries, Ecology, Neurology, Vision, Noise, Countermeasures, Psychomotor tests, Hemorrhage, Medicine, Vertigo, Fatigue (Physiology), Endocrine glands, Hormones.

AD-259 194 Div. 16
(10 July 61) OTS price $1.10

Pennsylvania U. Graduate School of Medicine, Philadelphia.
INJECTION OF A VOLATILE SUBSTANCE, ETHER, INTO THE BLOODSTREAM, AND ITS ELIMINATION FROM THE LUNGS.
Progress rept. 1 Mar-30 June 61,
by K. A. Feisal, J. Soni, and A. B. DuBois.
30 June 61, 5p. tables.
(Contract DA 18-108-cml-6556)
Unclassified report

DESCRIPTORS: *Blood vessels, *Ethers, *Lungs, Metabolism, Respiration, Injection, Measurement, Density, Excretion.

The elimination in the lungs of a volatile liquid (ether) injected into the blood stream has been measured by means of a whole body plethysmograph, using dogs. The mean circulation time from the pulmonary artery to the vessels of gas exchange was 1.1 seconds. This was 28% of the pulmonary circulation time from pulmonary artery to left atrium. The volume of gas evolved into the alveoli corresponded to that calculated from the partition coefficient and lung density. Reabsorption into the blood occurred slowly while the breath was held. If hyperventilation has been used, most of the ether injected would have been blown off from the lungs without ever reaching the systemic circulation. The application of this principle to other gases should be of interest, and may be predicted from the information obtained using ether. (Author)

AD-259 234 Div. 16
(11 July 61) OTS price $6.60

Armed Forces Inst. of Pathology, Army Medical Center, Washington, D. C.
ANNUAL PROGRESS REPORTS ON RESEARCH FOR ARMY

# Division 16 - MEDICAL SCIENCES

MEDICAL R&D CONTRACTS, 1 JULY 1960-30 JUNE 1961.
30 June 61, 76p. 39 refs.
Unclassified report

DESCRIPTORS: *Food, Radiation effects, Labeled substances, Antibodies, *Electron microscopy, Nerves, Neuromuscular transmission, Microwaves, Biochemistry, Respiratory diseases, Pathology, *Nutrition, Physiology, Virus diseases, Immunization, Identification, Antigens, *Diseases, Tissues (Biology), Surgical trauma, Eye, *Medical research, *Military research.

Contents:
Radiation and sterilization of foods, by F. D. Maurer and M. A. Ross
Development and application of a labeled antibody technique for electron microscope, by F. Borek
Motor end plates, by J. M. Blumberg
Biological and biochemical effects of microwaves, by R. E. Stowell
Procedures for quantitative electron microscopy, by G. F. Bahr
Investigation of respiratory diseases of laboratory animals, by F. D. Maurer
Fluorescent techniques, by J. M. Blumberg and J. F. Metzger
Biophysical and biological studies of the structure and function of ocular tissue, by L. E. Zimmerman

AD-259 235 Div. 16
(11 July 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ON SENSORIAL FUSION (ALLELOTROPY) AS A BASIS FOR STEREOSCOPY,
by A. V. Tachermak-Seysenegg. Jan 61, 22p. incl. illus. (Trans. no. MCL-296)
Unclassified report

DESCRIPTORS: *Stereoscopic vision, Eye, Physiology, USSR, Optometry.

AD-259 245 Div. 16
(11 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CONTRIBUTION TO THE PROBLEM OF THE REGULATION OF THE BREATHING AND CIRCULATION OF THE BLOOD IN THE SOMNOLENT STATE,
by A. V. Yeremin and I. N. Chernyakov. 12 May 61, 8p. incl. illus. 10 refs. (Trans. no. MCL-920 of Fiziologicheskiy Zhurnal SSSR, 7:541-545, 1956)
Unclassified report

DESCRIPTORS: *Respiration, *Blood circulation, *Sleep, *Cerebral cortex, *Conditioned reflex, Control, Rhythm, Motor reactions, Experimental data.

AD-259 286 Div. 16
(11 July 61) OTS price $4.60

Fordham U., New York.
OBSERVATIONS ON THE PRESENT STATE OF PLAGUE AND PLAGUE CONTROL IN THE SOVIET UNION (ACCORDING TO DATA AVAILABLE TO 31 OCTOBER 1960),
by Robert Pollitzer. Apr 61, 49p. incl. tables. (Rept. no. 3)
(Contract DA 18-108-405-cml-867)
Unclassified report

DESCRIPTORS: *Communicable diseases, USSR, Control, Serum, Therapy, *Preventive medicine, Sulfonamides, Antibiotics, *Pneumonic plague, *Immunology.

AD-259 301 Div. 16
(10 July 61) OTS price $1.60

Eastman Dental Dispensary, Rochester, N. Y.
A STUDY OF OSTEOGENESIS AND THE HEALING OF FRACTURES USING ALKALINE PHOSPHATASE AND CHONDROITIN SULPHATE.
Final rept. 1 Mar 60-28 Feb 61,
by Howard Aduss. 28 Feb 61, 15p. tables.
(Contract Nonr-314000)
Unclassified report

DESCRIPTORS: *Bone, *Bone fracture, *Phosphatases, *Chondroitin sulfate, *Muscles, *Expanded plastics, Orthopedics, Growth, Healing, Transplantation.

Areas of particular interest are indicated and further study to verify these hypotheses suggested. The more significant observations are summarized. Gelfoam, Ivalon, anorganic bone, and boiled-defatted bone treated with chondroitin sulphate or alkaline phosphatase, and implanted intramuscularly, failed to stimulate osteogenesis. Intramuscularly and within the femoral defect, the implant materials, both treated and control, were well accepted eliciting a slight to mild inflammatory response of short duration. The treated implants and the controls did not effect the pattern of healing over the bony defect. Three cellular zones were defined over the defect, an outer zone of fibrous tissue, a middle zone of cartilage, and an inner zone of proliferating host bone. In a femoral defect, boiled-defatted bone treated with chondroitin sulphate, showed a greater degree of invasion by host bone than the alkaline phosphatase treated implants or the control. The control was primarily encapsulated in fibrous tissue with very little bony invasion. Intramuscularly, and at the infrabony sites, gelfoam shows the most rapid rate of resorption, followed by Ivalon, boiled-defatted bone, and anorganic bone. Within a femoral defect, the heterogenous materials, both treated and control, do not stimulate osteogenesis, are not resorbed to any extent but are entrapped in host bone. (Author)

AD-259 340 Div. 16
(11 July 61) OTS price $1.60

Naval Radiological Defense Lab., San Francisco, Calif.
AORTIC ARTERIOSCLEROSIS IN THE DOG FOLLOWING LOCALIZED AORTIC IRRADIATION WITH ELECTRONS,
by S. Lindsay, C. Entenman, and others. 24 May 61, 22p. incl. illus. 12 refs. (Research and development rept. no. NRDL-TR-512)
Unclassified report

DESCRIPTORS: *Arteriosclerosis, Aorta, *Electrons, Histological sections, X rays, Electron bombardment, Electron beams, *Radiation effects, Radiation injuries, Production.

The inferior segments of the abdominal aortas of 15 dogs were irradiated with electrons in doses ranging from 1000 to 9500 rads, and were examined histologically at intervals ranging from 2 weeks to 17 months following irradiation. Pronounced aortic arteriosclerosis developed and was sharply localized to the aortic segment irradiated. Except in one dog, radiation-induced arteriosclerosis was more pronounced on the dorsal than on the ventral aortic wall. There was no evidence that severity of aortic arteriosclerosis was related to the dose of irradiation or was increased with time following irradiation. The development of arteriosclerotic lesions of the aorta induced by electron irradiation was similar to that observed after X-irradiation and to that occurring naturally in old dogs. It is suggested that electron irradiation may have caused selective injury of the internal elastic lamina, which was then followed by intimal fibrous proliferation and formation of intimal plaques. (Author)

AD-259 378 Div. 16
(20 July 61) OTS price $1.60

Kaiser Foundation Research Inst., Richmond, Calif.
NITROGEN FIXING ORGANISMS IN THE SEA,
by Mary Belle Allen. 15 June 61, 12p. incl. illus. tables, 15 refs.
(Contract Nonr-301500)

Unclassified report

DESCRIPTORS: *Sea water, *Microorganisms, *Nitrogen, Oceans, *Algae, *Yeasts, Growth, Bacteria, Metabolism, Sources, Storage, Marine biology.

Nitrogen in nature goes through a series of transformations from one chemical form into another. The question of nitrogen fixation in the sea can be divided into two parts: (a) do nitrogen fixing organisms occur in the sea, and, (b) if so, are they actively fixing nitrogen there. The first part of this question can be answered with an unequivocal yes. Nitrogen fixing marine microbes have been known for a number of years, since the sulfate reducing bacteria were found to carry out this reaction. A search has therefore been made for other potential biological sources of combined nitrogen in the sea. Because of the low concentration of organic matter in sea water, attention was first focused on autotrophic microorganisms, especially the blue-green algae. Routine screening of Northern California sea water samples to determine the number of nitrogen fixing organisms therein, pink yeasts of the genus Rhodotorula frequently developed on the plates of nitrogen-free media that were used. There is strong presumptive evidence that these yeasts fix nitrogen. Factors that may determine the growth of nitrogen fixing organisms in the sea are phosphate and some of the micronutrient elements, including iron, boron, calcium, and molybdenum. Evidence shows that nitrogen fixing microorganisms occur in sea water, often in considerable numbers, and that the available nutrients should permit them to grow and fix nitrogen there. (Author)

AD-259 405 Div. 16, 14
(11 July 61) OTS price $2.60

Army Prosthetics Research Lab., Walter Reed Army Medical Center, Washington, D. C.
(No Title).
Annual progress rept. 1 July 60-30 June 61, 30 June 61, 29p.

Unclassified report

DESCRIPTORS: *Artificial limbs, *Prosthetics, Laminates, Porous materials, *Materials, Polymers, Polymer solutions, Circulatory system, Synthetic fibers, Hooks, Hands, Mechanical properties, Epoxy resins, Plastics, Face, Eye, Joints (Physiology), Coatings, Surfaces, Design, Manufacturing methods.

AD-259 407 Div. 16, 25
(12 July 61) OTS price $5.60

Fluid Dynamics Research Lab., Mass. Inst. of Tech., Cambridge.
ENERGY EXCHANGE AND STABILITY CONSIDERATIONS IN THE CIRCULATORY SYSTEM,
by Erik Mollo-Christensen, May 61, 57p. incl. illus. 18 refs. (Rept. no. 61-7)
(Sponsored by the Alfred H. Caspary Fund and NASA grant NsG 31-61)

Unclassified report

DESCRIPTORS: *Circulatory system, Energy, Heart, *Biophysics, Blood pressure, Velocity, Blood vessels, *Blood circulation, Mathematical analysis, Oscillation, Arteries.

This paper discusses a possible mechanism of energy transmission from the heart to the peripheral circulation. It advances the hypothesis that the heart does not function as just an ordinary pump, but that it also emits mechanical waves, that these waves carry energy, and that the energy carried by the waves is given up to the mean bloodstream in the peripheral parts of the arterial system. (Author)

AD-259 421 Div. 16, 14
(12 July 61) OTS price $1.10

Army Prosthetic Research Lab., Walter Reed Army Medical Center, Washington, D. C.
EVALUATION OF STOCKINET MATERIALS FOR OUTER AND INNER COVERINGS OF POROUS PROSTHESES,
by James T. Hill. May 61, 6p. (Technical rept. no. 6103)

Unclassified report

DESCRIPTORS: *Artificial limbs, *Laminates, *Plastics, *Prosthetics, Materials, Surfaces, Porous materials, Physical properties, Tests.

Twelve samples of stockinet materials for porous prostheses coverings were evaluated. The evaluation consisted of strength, porosity, and general appearance of laminates prepared from these materials. Two of these samples were found satisfactory for further field tests. (Author)

AD-259 422 Div. 16, 14
(12 July 61) OTS price $1.10

Army Prosthetic Research Lab., Walter Reed Army Medical Center, Washington, D. C.
ADMEX 770 AND FLEXOL PEP IN VINYL COMPOSITIONS,
by James T. Hill and Donald R. Ingenito.
May 61, 8p. incl. tables. (Technical rept. no. 6110)

Unclassified report

DESCRIPTORS: *Artificial limbs, *Gloves, *Plasticizers, *Laminates, Plastics, Colors, Materials, Prosthetics, Resistance, Physical properties, Tests.

Two commercial plasticizers, Admex 770 and Flexol PEP, were substituted into the outer layer of the latest cosmetic dilaminar glove formulation to determine their desirability as non-polymerizable plasticizers. Two formulas gave greater stain resistances than the present formulation without an appreciable reduction in room temperature or low temperature flexibility. These formulations replaced completely the presently used nonpolymerizable plasticizers. (Author)

AD-259 424 Div. 16, 26, 14
(12 July 61) OTS price $1.10

Army Prosthetic Research Lab., Walter Reed Army Medical Center, Washington, D. C.
PROCEDURE FOR THE FABRICATION OF AN EXPANSIBLE PROSTHETIC ARM FOR MEDIUM TO LONG BE STUMPS,
by John Hodge, Jr. and Victor Riblett. May 61, 6p. (Technical rept. no. 6109)
Unclassified report

DESCRIPTORS: *Artificial limbs, *Arms, *Laminates, Amputation stumps, Prosthetics, Manufacturing methods.

A method for the fabrication of a below elbow arm using preformed laminates is described. The method virtually eliminates the use of wet resins in the limb shop fabrication of arms for BE amputees with medium to long BE stumps. In the technique conical shaped preformed laminates are fabricated and expanded. They are stored in the expanded form until ready for use at which time they are shrunk back by heat to the desired stump shape. To satisfy the various sizes four preforms have been prepared for inner socket fabrication and three for outer socket preforms. (Author)

AD-259 426 Div. 16
(12 July 61) OTS price $1.10

Army Prosthetics Research Lab., Walter Reed Army Medical Center, Washington, D. C.
EVALUATION OF SIERRA VO HAND (NO. VO 111),
by John Hodge and Victor T. Riblett. June 61, 5p. (Technical rept. no. 6113)
Unclassified report

DESCRIPTORS: *Artificial limbs, *Hands, Springs, Operation, Motion, Tests, Mechanical properties, Prosthetics.

One Sierra Voluntary Opening Hand was cycled to determine the durability of the operating mechanism. The duration of this test was 91,076 cycles. There were no apparent defects. (Author)

AD-259 448 Div. 16
(14 July 61) OTS price $1.60

Duke U., Durham, N. C.
(No title)
Tri-annual progress rept. of Research no. 7, 1 Oct 60-31 Jan 61,
by Norman F. Conant. 31 Jan 61, 16p. incl. illus. tables.
(Contract DA 18-064-404-cml-170)
Unclassified report

DESCRIPTORS: *Immunization, *Antigens, *Communicable diseases, Fungus infections, Dosage, Anitbodies, Countermeasures, Cells (Biology), Biochemistry.

AD-259 450 Div. 16
(14 July 61) OTS price $1.60

Duke U., Durham, N. C.
(No title).
Tri-annual progress rept. of Research no. 8, 1 Feb-31 May 61,
by Norman F. Conant. 31 May 61, 10p.
(Contract DA 18-064-404-cml-170)
Unclassified report

DESCRIPTORS: *Immunization, *Fungus infections, *Antigens, Antibodies, Cells (Biology), Countermeasures, Biochemistry.

AD-259 481 Div. 16, 28, 3
(14 July 61) OTS price $1.60

Indiana U., Bloomington.
BASIC PSYCHOLOGICAL STUDIES OF THE EFFECTS OF INCAPACITATING AGENTS,
by Roger W. Russell. 15 Mar 61, 12p. incl. table (Rept. no. 2)
(Contract DA 18-108-405-cml-738)
Unclassified report

DESCRIPTORS: *Chemical warfare agents, *Drugs, Emotions, Motor reactions, Reaction (Psychology), Pharmacology, Biochemical tests, Colorimetric analysis, Ultraviolet spectroscopy, Blood chemistry, Toxicity, Measurement.

Contents:
Librium
Screening in depth: animal
  Conditioned emotional response
  Straightaway operant response
  Conditioned shuttle response
  Instrumentation
    (a) study rat behavior
    (b) research on monkeys
Related research in the Department of Psychology, Indiana University
Laboratory tests: man
Biochemical and pharmacological studies
  Colorimetric determination of Librium
  Ultra violet adsorption spectra studies
  Studies on the N-oxide grouping
Blood analysis studies on Librium-treated human subjects
    Blood level studies
    Ultra violet spectra of blood extracts
Research in progress
  Basic rat toxicity studies
  Blood level-time curve
Plans for continuation of the present project

AD-259 512 Div. 16
(13 July 61) OTS price $9.10

Operations Research, Inc., Silver Spring, Md.
WEIGHTLESSNESS. TRAINING REQUIREMENTS AND SOLUTIONS,
by Barry G. King, Cephas T. Patch, and Paul G. Shinkman. 3 Mar 61, 102p. incl. illus. tables.
(Contract N61339-560)
(NAVTRADEVCEN 560-1) Unclassified report

DESCRIPTORS: *Weightlessness, Physiology, Stress (Physiology), Training, Motor reactions, Space flight, Space medicine, Muscles.

Physical principles and biological mechanisms relevant to human performance under conditions of weightlessness have been explained in order that the trainee can develop an appreciation of how the unaccustomed environment will affect his behavior. Special emphasis has been given to (a) changes of man's center of mass as various parts of the body are moved with respect to each other, and the significance of CM of body movement, (b) the mechanisms of postural reflexes, including experimental observations of response of pigeons to postural disorientation by tilting during weightlessness, and (c) anticipated changes in the sensory input spectrum and implications of such changes. Models have been proposed as visual aids in providing for cognitive learning aspects of training. The different effects of weightlessness on motor-perceptual and perceptual factors have been identified and solutions proposed for separately training each of these effects. (Author)

AD-259 593 Div. 16
(14 July 61) OTS price $10.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
VIBRATION AND HUMAN BODY,
by Masamitsu Oshima. 25 Apr 61, 1v. incl. illus. tables, 16 refs. (Trans. no. MCL-803 of Tekko Rodo Eisei 2:39pp., 1953)
Unclassified report

DESCRIPTORS: *Vibration, *Body, Frequency, Fatigue (Physiology), Pain, Pain thresholds, Metabolism, Visual perception, Respiration, Oxygen consumption, *Physiology, Injuries, Mathematical analysis, Carbon dioxide.

AD-259 594 Div. 16, 1
(14 July 61) OTS price $12.00

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
REVIEW OF AERONAUTICAL AND SPACE MEDICINE (SELECTED ARTICLES).
25 Apr 61, 166p. incl. illus. tables (Trans. no. MCL-787 of Rivista Di Medicina Aeronautica E Spaziale 23:347-436, Sep 60)
Unclassified report

DESCRIPTORS: *Space medicine, *Aeronautics, *Aviation medicine, Aviation personnel, Respiration, Electrocardiography, Acceleration, Body weight, Heart, Blood pressure, Arteries, Radiobiology, *Symposia, Barometric pressure, Tranquilizing drugs, Muscles, Ballistocardiography, Instrumentation, Pilots, Effectiveness, *Scientific research, *Medical research, Analysis, Tests.

Contents:
Pulmonary volume reports on 124 athletes ranging in ages from 20 to 39 years, by G. Fumagalli, R. Serra, and S. Berzolla
Modification of the electrocardiogram of albino rats subjected to tangential (transversal) acceleration before and after splenectomy, by C. Vacca & L. Vacca
Behavior of body weight, heart rate and arterial pressure in 1,000 Italian pilots in relation to their age and performance, by A. Scano
Quantitative evaluation of the ballistocardiogram after muscular strain
Effect of low barometric pressure and of some tranquilizers on the spontaneous motorial activity of mice, by F. Sparvieri
Symposium on medical radiobiology

AD-259 605 Div. 16, 32
(17 July 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
MAN AND NATURE ( PARTS I AND II).
by N. N. Semenov. 25 May 61, 15p. (Trans. no. MCL-991 of Pravda No. 1 (15491) p. 3, 1 Jan 61 and Pravda No. 27 (15517), p. 4, 27 Jan 61)
Unclassified report

DESCRIPTORS: USSR, *Man, Power plants, *Food, *Chemistry, *Power supplies, *Materials, Production, Agriculture, *Industry.

AD-259 633 Div. 16, 20
(17 July 61) OTS price $1.60

Army Medical Research Unit (Europe).
BIOLOGICAL MEDICAL ASPECTS OF IONIZING RADIATION.
Annual progress rept. 1 July 60-30 June 61,
by Charles O. Onstead, Frank V. Keary, and Erich Oberhausen. 30 June 61, 10p. incl. illus.
(Rept. no. MEDDH-288)
(Proj. 6x64-14-001)
Unclassified report

DESCRIPTORS: *Body, Man, *Radioactivity, Radioactive isotopes, *Scintillation counters, Body weight, Biophysics, Cesium, Potassium, Radium, Thorium, *Diagnosis, *Tracer studies, Anthropometry, Measurement, Contamination, Calibration.

A two Pi liquid scintillation whole body counter continued to be used to study the radioactivity in man. More than three thousand normal subjects were measured during this fiscal year. An improved method of instrument calibration was devised. The cesium-137 concentration in man was found to be decreasing at a rate equivalent to 15-16 months. The cesium-137 and potassium-40 data are forwarded to the Walter Reed Army Institute of Research at monthly intervals. The instrument is also being used to study individuals contaminated with radium and thorotrast and as an aid in clinical diagnosis. (Author)

AD-259 635 Div. 16, 1
(17 July 61) OTS price $16.00

Air Force Missile Development Center, Holloman Air Force Base, N. Mex.
MANHIGH III. USAF MANNED BALLOON FLIGHT INTO THE STRATOSPHERE.
Apr 61, 236p. incl. illus. tables (Rept. no. AFMDC TR 60-16)
Unclassified report

DESCRIPTORS: *Balloons, Manned, Nutrition, *Stratosphere, *Space medicine, Physiology, Closed cycle ecological systems, *Cosmic rays, Effectiveness, Psychology, Space environmental conditions, Radiation effects, Flight testing, Flight instruments, Simulation, Scintillation counters, Temperature.

This report covers the manned balloon flight MANHIGH III, the third, and last, of a series of flights into the stratosphere directed by the Aeromedical Field Laboratory. Twelve sections prepared by the pilot and the task scientists, describe the vehicle and its performance, selection and preparation of prospective pilots, the principal psychological and physiological parameters of the subject before, during and after the flight, the operation of a sealed environment under space equivalent conditions, cosmic radiation studies, and related problems such as pilot's nutrition. (Author)

# Division 16 - MEDICAL SCIENCES

AD-259 702 Div. 16
(17 July 61) OTS price $1.10

Valley Forge General Hospital, Phoenixville, Pa.
RETURN OF MILITARY MEMBERS TO DUTY TO CONTINUE THERAPY, WHILE ON A DUTY STATUS, FOR PERIODS UP TO 12 MONTHS AND ANNUAL FOLLOW-UP FOR A MINIMUM OF FIVE YEARS AFTER COMPLETION OF CHEMOTHERAPY.
Annual progress rept. 1 July 60-30 June 61, by William G. Dunnington and William C. Hollifield. 30 June 61. 5p.
Unclassified report

DESCRIPTORS: *Therapy, Lungs, Diseases, Biochemical tests, *Chemotherapeutic agents, *Pulmonary tuberculosis, *Respiratory diseases, Drugs.

To 30 June 1961, 559 patients have been returned to duty on chemotherapy. X-ray and gastric reports were requested each three (3) months while the returnee is continuing chemotherapy. At the completion of chemotherapy, X-rays were requested during the birth month of each patient. At the present time the over-all follow-up percentage is approximately 80%. When the study was instituted, follow-up to completion of chemotherapy only was accomplished. Of the total number returned to duty under this program, thirteen (13) were readmitted at various times because of question of possible relapse. Most of these were on the basis of an isolated positive culture; in some cases because of a positive (gastric) smear. Two (2) of this group were proven to have relapsed. Study of high and low regimens of INH was continued as such. However, the patients were discharged to duty on these various regimens, and periodic reporting of each is prescribed.

AD-259 728 Div. 16
(18 July 61) OTS price $1.10

Brooke Army Medical Center, Fort Sam Houston, Tex.
CARDIAC ARREST AND RESUSCITATION, PART II. A STUDY OF VENTRICULAR FIBRILLATION.
Annual progress rept. 1 July 60-30 June 61, by George F. Rumer, Martin H. Bouman and John W. LaValley. 30 June 61, 4p.
(Proj. 6359-01-001)
Unclassified report

DESCRIPTORS: *Heart arrest, *Epinephrine, *Procaine, Experimental data, Stimulation, Therapy.

There is a great need to examine and evaluate the practices which are currently being employed in ventricular defibrillation procedures. The work being performed in this laboratory is aimed toward obtaining data that may be used to answer questions dealing with the use of procaine as an agent to aid resuscitation of a fibrillating heart. As of this reporting period the first phase of research has been partially completed and a general trend has begun to emerge. To date only limited results have been accomplished. (Author)

AD-259 729 Div. 16
(18 July 61) OTS price $1.10

Brooke Army Medical Center, Fort Sam Houston, Tex.
TREATMENT PROCEDURES OF LOW VELOCITY FRAGMENTARY WOUNDS.
Final rept. 1 July 60-30 June 61, by George F. Rumer, Martin H. Bouman and John W. LaValley. 30 June 61, 5p.
(Proj. 6-59-12-022)
Unclassified report

DESCRIPTORS: *Battle injuries, *Wounds, *Tissues (Biology), *Therapy, *Ammunition fragments, Radiological warfare, Healing, *Collagen, Infections, Experimental data.

In the event of thermonuclear warfare it is anticipated that there will be large numbers of low velocity missile wounds of the soft tissue structures. The current treatment procedure for this type wound will not be applicable due to many factors, most important of which will be the lack of qualified medical personnel. The aim of this project was to gather sufficient data that might have been used to establish minimal treatment requirements which could be followed, at a later date, by definitive treatment and still yield a well healed wound. To attain this end a pilot study was initiated and completed utilizing 20 dogs as the experimental animal. The Ivalon Sponge Biopsy Technique was used in this study and was found unsatisfactory for reasons explained in this report. (Author)

AD-259 748 Div. 16
(18 July 61) OTS price $3.60

New York State Psychiatric Inst., N. Y.
METABOLISM OF GLUTATHIONE, GLUTAMINE AND ASPARAGINE.
Final progress rept. 15 Apr 51-31 July 61, by Heinrich Waelsch. 1 June 61, 28p. 50 refs.
(Contract Nonr-36900, Proj. NR 123-069)
Unclassified report

DESCRIPTORS: *Glutathione, *Glutamine, *Amides, *Aspartic acid, *Glutamic acid, Amino acids, *Peptides, *Metabolism, Enzymes, Histidine, Biosynthesis, Proteins, Ammonia.

In this final report are described the main results of investigations carried out since 1951. The investigations dealt with the metabolism of the dicarboxylic amino acids, glutamic and aspartic acids, and some of their metabolic derivatives, such as glutamine, asparagine, glutathione, and other peptides. Since various glutamic acid derivatives have been claimed to be breakdown products of histidine metabolism the enzymatic degradation of histidine was studied and a labile intermediate isolated and identified. The identification of formamidinoglutaric acid as a labile intermediate in enzymatic histidine breakdown led to an elucidation of the catabolic pathway of histidine and to a study of the mechanism of synthesis of histidine in bacteria. Another aspect of interest in glutamic acid metabolism led to the discovery of two enzymes which catalyze the exchange of the amide groups of free glutamine (glutamotransferase) and of protein bound glutamine (transglutaminase). Parallel with these studies, investigations on the metabolism of proteins, glutamic acid and ammonia in vitro and in vivo, particularly in the nervous system, were carried out. (Author)

AD-259 758 Div. 16
(19 July 61) OTS price $17.00

Brooke Army Medical Center, Fort Sam Houston, Tex.
ANNUAL PROGRESS REPORT, 1 JULY 1960 TO

30 JUNE 1961,
by William H. Hall and Joseph F. Powers.
30 June 61. 196p. incl. illus.
(Proj. 6X59-01-001)
Unclassified report

DESCRIPTORS: *Traumatic shock, Surgery, *Burns, Thermal radiation, Metabolism, Infections, Immunization, Medical examination, Pathology, Kidneys, Blood vessels, Radiation effects, *Radiation injuries, Tests, Bacteria, Physiology, Antibodies.

Contents:
Traumatic surgery and shock
Acute renal failure
Physiology and treatment of trauma
Radiation and thermal burns
Biochemical and physiologic alterations in burns
Metabolic responses to burns
Infection and immunologic studies in burns
Clinical management of burns
Pathology of burns

AD-259 859 Div. 16
(24 July 61) OTS price $1.10

Fitzsimons General Hospital, Denver, Colo.
FLUORESCENT ANTIBODY METHODS AS A HELP IN THE CLINICAL DIAGNOSIS OF STREPTOCOCCAL SORE THROAT.
Final (Annual progress) rept. 1 Sep 60-30 June 61,
by H. E. Shuey and L. A. Estela. 30 June 61. 6p.
(Proj. no. 21x 2040 6-2004 P 5010 08 S5-015)
Unclassified report

DESCRIPTORS: *Streptococcus infection, Fluorescent dyes, *Mouth, Bacteria, *Microbiology, Tests, *Medical examination, Antibiotics, Test methods, *Biological stains.

Duplicate throat swabs were collected from patients with suspected clinical picture of streptococcal sore throat. A sheep blood agar plate was prepared and the swabs immersed in Bacto Todd-Hewitt Broth and incubated for at least a period of two hours at 37 C. After 24 hours incubation at 37 C typical beta hemolytic streptococcus colonies were picked from the plates and used for the precipitin and bacitracin discs (2 units) sensitivity tests. Two smears were made from homogenates on thoroughly cleaned slides. The smears were allowed to air dry, fixed in absolute alcohol for one minute and stained with fluorescein tagged group A streptococcus antiserum for 30 minutes. After staining, the smears were rinsed in buffered saline, blotted dry and mounted with buffered glycerol saline. These smears were then observed for presence or absence of characteristic yellow fluorescent streptococci with ultraviolet light from a specially fitted dark field microscope. Results obtained this way were correlated with those obtained by the precipitin technique and the bacitracin disc inhibition. (Author)

AD-259 899 Div. 16
(24 July 61) OTS price $17.50

Army Medical Research and Nutrition Lab., Denver, Colo.
ANNUAL PROGRESS REPORT, 1 JULY 1960 TO 30 JUNE 1961 ON PROJECT 6X60-11-001.
30 June 61, 268p. 63 refs.
Unclassified report

DESCRIPTORS: *Nutrition, *Medicine, Diet, *Biochemistry, *Physiology, Drugs, Metabolism, Food, Infections, Prosthetics, *Bibliography.

AD-259 949 Div. 16
(21 July 61) OTS price $1.60

Fordham U., New York.
OBSERVATIONS ON THE PRESENT STATE OF PLAGUE AND PLAGUE CONTROL IN THE SOVIET UNION (ACCORDING TO DATA AVAILABLE TO 31 OCTOBER 1960) ADDENDUM. SUPPLEMENTANY BIBLIOGRAPHY ON PLAGUE.
by Robert Pollitzer. June 61, 18p. 85 refs.
(Addendum to Rept. no. 3, AS-259 286)
(Contract DA 18-108-405-cml-867)
Unclassified report

DESCRIPTORS: *Bibliography, *Plague, Bacterial vaccines, *Immunization, Epidemiology, Viruses, Virus vaccines, Blood, Aerosols, Skin, Antibiotics, Metabolism, Parasitology, Parasitic infections, Chemotherapeutic agents, Microbiology, USSR.

AD-259 950 Div. 16
(24 July 61) OTS price $1.10

Fitzsimons General Hospital, Denver, Colo.
DEVELOPMENT AND EVALUATION OF AUTOMATIC PROCE DURES FOR THE DETERMINATION OF ALBUMIN, GLOBULIN, GLUTAMIC-OXALOACETIC TRANSAMINASE AND PROTEIN-BOUND IODINE IN SERUM.
Annual progress rept. 1 Sep 60-30 June 61,
by Clarence O. Stevens and Nicholas G. Levandoske. 30 June 61, 3p.
(Proj. 6x97-87-007)
Unclassified report

DESCRIPTORS: Serum, *Biochemical tests, Albumins, Preparation, Effectiveness, Glutamic acids, Oxaloacetic acid, Enzymes, Proteins, Test methods, Pathology, *Serum albumin, *Blood proteins, Automatic, Instrumentation, Iodine.

Utilizing the Technicon Autoanalyzer, a satisfactory method was devised for the automatic determination of protein-bound iodine in normal and pathological sera. Methods recently reported by other workers for the automatic determination of total protein and albumin were evaluated and one selected for routine use. Work continues on development of an automatic method for glutamic-oxaloacetic transaminase determinations. (Author)

AD-259 995 Div. 16, 20
(24 July 61) OTS price $1.60

Naval Radiological Defense Lab., San Francisco, Calif.
RENAL HYPERTROPHY AND FUNCTION IN IRRADIATED AND NEPHRECTOMIZED RATS FED A HIGH PROTEIN DIET,
by F. Konishi and R. W. Brauer. 26 June 61, 18p. incl. illus. tables (Rept. no. NRDL-TR-517)
Unclassified report

DESCRIPTORS: *Kidneys, Blood vessels, Diet, Proteins, Growth, Pathology, X-rays, *Thermal radiation, Excision, *Radiation injury, Laboratory animals, *Radiation effects.

Male rats exposed to a total of 740 rads X-irradiation, were subsequently fed a hyperprotein diet and unilaterally nephrectomized to investigate functional and compensatory regenerative capacity of the kidney as probable indices of residual radiation injury. The extent of compensatory hypertrophy after nephrectomy showed a significantly greater increase due to the hyperprotein diet but no effect by irradiation. Estimates of maximal tubular excretions of PAH, however, were significantly greater in the irradiated groups than in control groups when determined 3 weeks

post-nephrectomy. Renal clearances of CIN and CPAH were significantly depressed after nephrectomy but not after radiation. Histological studies of the kidneys did not indicate renal damage by radiation except for an isolated instance of a renal neoplasm in an irradiated, nephrectomized rat fed a hyperprotein diet. The results indicate that radiation does not modify compensatory hypertrophy after unilateral nephrectomy but appears to increase the apparent functional capacity of the tubules. (Author)

AD-259 997 Div. 16
(24 July 61) OTS price $2.60

Naval Medical Research Unit No. 2, Taipei, Taiwan.
NON-MARINE MOLLUSCA FROM THE FLORIDA ISLANDS, SOLOMON ISLANDS,
by Alan Solem. 1 June 61, 22p. incl. illus. tables, 29 refs. (Special rept. no. 18)
Unclassified report

DESCRIPTORS: *Mollusca, Florida, *Animals, Terrain, Anatomy, *Ecology, *Snails.

An investigation was undertaken to study the Mollusca which were known inhabitants of terrestrial ecosystermos of Florida, Tulagi Islands and Solomon Islands. Land and fresh water molluscs were collected. The morphological and anatomical characteristics were observed to determine the existence of new species in these areas. New species that were found are Nocella kuntzi, Orpiella kuntzi, Palaina floridana, Palaina clappi, and Palaina megamorpha.

# 17. METALLURGY

AD-259 066 Div. 17
(5 July 61) OTS price $1.10

New England Materials Lab., Inc., Medford, Mass.
HARD PARTICLE STRENGTHENING OF REFRACTORY METALS FOR HIGH TEMPERATURE USE THROUGH INTERNAL OXIDATION.
Progress rept. no. 2, 1 Mar-30 Apr 61,
by A. S. Bufferd, K. M. Zwilsky, and N. J. Grant. 29 May 61, 6p. incl. tables.
(Contract NOw 61-0316-c; Continuation of Contract NOa(s) 59-6223-c)
Unclassified report

DESCRIPTORS: *Molybdenum alloys, Oxygen, Titanium alloys, Oxidation, Mechanical properties, Hardening, Extrusion, Explosive forming, *Powder alloys, *Heat resistant alloys, *Refractory materials, Oxides, *Dispersion hardening, Titanium compounds, Diffusion, Particles.

Mechanical properties of internally oxidized Mo-1.5% Ti extruded in a Dynapak are being investigated. Powder (-325 mesh) obtained from machining and ball milling a Mo-1.5% Ti ingot was consolidated into six billets for further Dynapak extrusions. (Author)

AD-259 092 Div. 17, 26
(5 July 61) OTS price $1.10

Reactive Metals, Inc., Niles, Ohio.
THE MANUFACTURE OF Ti-7AL-12ZR SHEETS.
Bi-monthly rept. no. 10, 28 Feb-30 Apr 61, by J. K. Dietzel and S. R. Seagle. June 61, 6p. incl. tables.
(Contract NOa(s) 59-6229-c)
Unclassified report

DESCRIPTORS: *Heat resistant alloys, *Titanium alloys, *Sheets, *Manufacturing methods, Processing, Production, Aluminum alloys, Zirconium alloys, Rolling mills, Surface properties, Pickling, Cleaning, Contamination, Heat treatment, Tensile properties, Creep, Mechanical properties.

A method of flattening 0.125-in. Ti-7Al-12Zr sheet between 2 in. thick steel plates was developed. Preliminary data from the annealing temperature survey showed that the ductility of annealed 0.040-in. sheet after thermal exposure was 13.6%, and after creep exposure, 11.6%. The first 0.020-in. sheet was finish hot-rolled in production and tested. The results showed that 0.012-in. had to be removed from the sheet to achieve satisfactory properties after thermal exposure. One-half of the scheduled number of production size 0.063-in. sheets was rolled to final gage. (Author)

AD-259 099 Div. 17, 26
(5 July 61) OTS price $2.60

Sylvania Electric Products, Inc., Towanda, Pa.
DEVELOPMENT AND PRODUCTION OF IMPROVED MOLYBDENUM SHEET BY POWDER METALLURGY TECHNIQUES.
Interim rept. no. 8, 1 Feb-31 Mar 61,
by Russell C. Nelson, Roger B. Bargainnier, and Lauri D. Tiala. 25 Apr 61, 17p. incl. illus. tables.
(Contract NOa(s) 60-6018-c)
Unclassified report

DESCRIPTORS: *Molybdenum, *Molybdenum alloys, *Powder alloys, *Powder metallurgy, Sheets, Processing, Production, Sintering, Rolling mills, Additives, Titanium alloys, Zirconium compounds, Carbon alloys, Oxides, Hydrides, Crystallization, Tungsten alloys.

Effort was continued to evaluate commercial arc-cast Mo-0.5Ti sheet to establish base-line data for comparison with improved alloy sheet made by powder metallurgy. Unalloyed Mo and 4 Mo alloys exhibited good densification after being sintered for relatively short periods at temperatures above 2000 C. Two of the alloy compositions were rolled successfully to sheet, namely, Mo-0.5Ti-0.05C and Mo-1.27Ti-0.29ZrH2-0.3C. This is the first time that sheet of the latter composition has been prepared by powder metallurgy methods. Three rolling schedules currently being employed are outlined. The rolling of several alloys, including the optimization of Mo-Ti-C, is described. (Author)

AD-259 116 Div. 17, 26
(6 July 61) OTS price $14.50

Westinghouse Electric Corp., Pittsburgh, Pa.
RESEARCH AND DEVELOPMENT OF TANTALUM- AND TUNGSTEN-BASE ALLOYS.
Final rept. 27 June 58-26 Mar 61,
by A. L. Feild, Jr., R. L. Ammon and others. 26 May 61, 199p. incl. illus. tables, 25 refs.
(Contract NOa(s) 58-852-c)
Unclassified report

DESCRIPTORS: *Heat resistant alloys, *Tantalum alloys, *Tungsten alloys, Preparation, Hafnium alloys, Rhenium alloys, Mechanical

properties, Hardness, Oxidation, Microstructure, Processing, Powder alloys, Sintering, Melting, Extrusion, Explosive forming, Rolling mills, Sheets, Zirconium alloys.

The effects of alloying upon the properties of Ta and W were examined. A 20-g button survey was made of the Ta-W-Hf and Ta-W-Re ternary systems to determine hardness, fabricability, oxidation resistance, and microstructure as a function of composition. The effects of substituting or adding Ti, Zr, V, Cb and Cr into Ta- and W-base alloys were also examined. A satisfactory technique was worked out for melting and fabrication of Ta-base alloys by arc melting from pressed and sintered electrodes and impact extruding at 1700 C with a Dynapak machine. The mechanical properties of the Ta-base alloys were determined from -320 F to 3000 F on 50 mil sheet specimens. The alloys in general possess a remarkable combination of excellent low temperature ductility and substantial high temperature strength. (Author)

AD-259 132 Div. 17
(7 July 61) OTS price $10.50

Climax Molybdenum Co. of Michigan, Detroit.
DEVELOPMENT OF TUNGSTEN-BASE ALLOYS.
Final rept. June 58-Dec 60,
by M. Semchyshen and Robert Q. Barr. 20 June 61, 133p. incl. illus. tables.
(Contract NOa(s) 58-847-c)
Unclassified report

DESCRIPTORS: *Heat resistant alloys, *Tungsten alloys, Melting, Casting, Electric arcs, Microstructure, Hardness, Lattices, Oxidation, Additives, Cobalt alloys, Niobium alloys, Hafnium alloys, Tantalum alloys, Vanadium alloys, Zirconium alloys.

Arc-cast W-base binary alloy ingots were prepared with 0.0 to 2.7% Co; 0.0 to 11.7% Nb; 0.0 to 3.6% Hf; 0.0 to 18.1% Ta; 0.0 to 9.3% V; and 0.0 to 3.8% Zr. Studies were made of the effects of alloy additions on the lattice parameter, macrostructure, microstructure, hardness, oxidation resistance at 2000F, and forgeability. Vanadium caused a contraction of the W lattice, Co caused a slight expansion, and the other elements caused a marked expansion of lattice. The limit of solid solubility of Zr in W was about 0.75 wt-%; limited solid solubility of Co and Hf was indicated by metallographic examination, but was not confirmed by lattice parameter measurements. In descending order of effect on elevated temperature hardness are Co, Zr, Hf, V, Nb, and Ta. Co and V additions increased the oxidation rate of W, while insignificant rate reductions were observed for additions of Nv, Hf, Ta, and Zr. None of the forging test specimens were completely crack free.

AD-259 152 Div. 17
(7 July 61) OTS price $4.60

Westinghouse Electric Co., Pittsburgh, Pa.
SOME ASPECTS OF STRESS CORROSION CRACKING IN AUSTENITIC STAINLESS STEELS,
by D. van Rooyen. 25 Aug 60, 44p. illus. tables, 22 refs. (Technical rept. no. 3)
(Contract Nonr-286800, Proj. NR 036-044)
Unclassified report

DESCRIPTORS: *Stainless steel, Corrosion, Stresses, Fracture (Mechanics), Austenite, Grains (Metallurgy), *Corrosion research, Test methods, Electrochemistry, Electrolytic cells, Polarization, Deformation, Anodes.

The addition of small amounts of N, or larger amounts of Mo, reduces the resistance of austenitic stainless steels to transgranular stress corrosion cracking. Increasing the C or Ni, and perhaps Sn, makes the alloys more resistant to cracking. Composite stress corrosion samples were made in which the test alloys were bonded to a steel which was susceptible to cracking. Results showed good correlation between the times to failure of the experimental alloys when tested alone, and the number of propagating cracks which will penetrate into them. Potential measurements indicate that strain-induced anodic depolarization cannot account for cracking entirely by an electrochemical mechanism. Preference is given to an electrochemical mechanism wherein reaction takes place at sites of structural and composition changes in the steels. These may be formed under the influence of stress, setting up paths of easy localized corrosion. (Author)

AD-259 177 Div. 17, 30
(10 July 61) OTS price $.50

Defense Metals Information Center, Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS IN THE EVALUATION OF SPECIAL METAL PROPERTIES,
by J. E. Campbell. 27 June 61, 10p. incl. illus.
(DMIC memo. no. 112)
Unclassified report

DESCRIPTORS: *Metals, *Low temperature research, Low temperature alloys, Test methods, Test facilities, *High temperature research, Mechanical properties, Sheets, Aluminum alloys, Magnesium alloys, Stainless steel, Nickel alloys, Titanium alloys, Fatigue (Mechanics), Fracture (Mechanics), Pressure vessels, Tensile properties, Alloys.

A brief review is presented of techniques for special testing of materials, test results and sources of information on special testing procedures. Test data on tensile properties are presented for sheet Al and Ti alloys and for AISI 310 stainless steel to -423F. A paper on the compression testing of sheet at elevated temperatures with compression testing jigs and associated techniques is discussed briefly as well as a report on burst tests on deep-drawn pressure vessels.

AD-259 178 Div. 17
(10 July 61) OTS price $.50

Defense Metals Information Center, Columbus, Ohio.
A REVIEW OF RECENT DEVELOPMENTS IN TITANIUM AND TITANIUM ALLOY TECHNOLOGY,
by R. A. Wood. 3 July 61, 4p. incl. table, 12 refs. (DMIC memo. no. 113)
Unclassified report

DESCRIPTORS: *Titanium, *Titanium alloys, Fracture (Mechanics,), Heat treatment, Aging, Creep, Test methods, Scientific research, Heat resistant alloys, Sheets, Low temperature research, High temperature research, Alloys.

Research activity on Ti-13V-11Cr-3Al, Ti-8Al-1Mo-1V, and Ti-8Al-10V alloys for both high and low temperature applications is reviewed. Mechanical properties, heat treatments and processing techniques are briefly discussed. Sources of information on new developments are indicated.

# Division 17 - METALLURGY

AD-259 191 Div. 17
(11 July 61) OTS price $1.10

Case Inst. of Tech., Cleveland, Ohio.
RESEARCH ON INTERSTITIAL ALLOYING ELEMENTS IN THE MECHANICAL BEHAVIOR OF METALS.
Quarterly rept. no. 8, 16 Jan-16 Apr 61,
by J. Destrez, C. Koch and others. May 61, 2p.
(Contract AF 33(616)6419)

Unclassified report

DESCRIPTORS: *Hydrogen embrittlement, *Steel, *Nickel alloys, Austenite, Mechanical properties, Heat treatment, Failure (Mechanics), Phase studies, Brittle materials, Metals, Alloys, Tensile properties, Fracture (Mechanics), Crystal structure, Microstructure.

A 9% Ni steel heat treated to obtain structures with 0, 3, and 13% austenite was used to investigate the influence of retained austenite on the H embrittlement phenomenon. Ductility was determined as a function of H concentration. The recovery of ductility by baking the hydrogenated specimens and the effect of transforming the H charged 13% austenite on the embrittlement were studied. The presence of retained austenite in the 9% Ni steel minimized the embrittling effects of H, but acted as a sink for H during baking treatments. Transformation of the 13% austenite after charging and baking caused additional embrittlement. Static loading at 400 F of hydrogenated K-monel, with an NTS of 260,000 psi, baked 5 min at 950 F indicated that this alloy is subject to delayed failure. Delayed failure by discontinuous crack propagation was observed in 300 m ultra-high-strength steel (.43% C, .89% Mn, 1.78% Si) sheet at various temperatures between 150 and 530 F. An effort is being made to ascertain the mechanism responsible for the existence of a fracture strength minimum as a function of time to rupture.

AD-259 238 Div. 17, 25
(11 July 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CONCERNING THE PROBLEM INVOLVED IN THE EQUIVALENCE OF EFFECT EXERTED BY THE RATE AND TEMPERATURE OF DEFORMATION ON THE PLASTIC DEFORMATION PROCESS,
by L. Ye. Popov. 12 May 61, 17p. incl. illus. 13 refs. (Trans. no. MCL-448 of Izvestiya Vysshykh Uchebnykh Zavedeniy - Fizika 3:91-99, 1958)

Unclassified report

DESCRIPTORS: *Nickel, *Plasticity, *Deformation, Plastic flow, Crystals, Microstructure, Mechanical properties, Temperature, Metallic crystals, Hardening, Lattices, Tests, Test methods, Test equipment, Stresses, USSR.

A comparative study was made concerning the effect of the rate and temperature of deformation on the mechanical properties and microstructure of polycrystalline Ni within the temperature range from 356 to 467 C. The flow curves remained constant within this range of temperatures. A statistical study of the microstructure of deformed specimens demonstrated that the contribution of various deformation mechanisms to the total deformation is determined by flow stresses, and does not depend, at the given flow curve, on the rate and temperature of deformation. (Author)

AD-259 250 Div. 17
(11 July 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
PROBLEMS OF CORRODING STRUCTURAL MATERIALS BY LIQUID METALS (Problemy Korose Konstrukcnich Materialu Tekutymi Kovy),
by Alois Dvorak, 31 Mar 61, 20p. incl. illus. tables, 10 refs. (Trans. no. MCL-883 of Jaderne Energie 6:155-162, 1960).

Unclassified report

DESCRIPTORS: *Liquid metals, *Corrosion, *Heat exchangers, Materials, Metals, Alloys, Corrosion resistant alloys, Corrosion research, Liquid metal cooled reactors, Nuclear power plants, Physical properties, Chemical properties, Melting, Isotopes, Test methods, Test equipment, Corrosion inhibition, Additives, Corrosive liquids, USSR.

Data are presented on the specific nature of destruction of structural material by liquid (hot) metals and the actual influences of these corrosive actions. Characteristic investigations of corrosion caused by hot metals, principles of corrosion testing and measures leading to increasing the corrosion resistance of structural materials are discussed. (Author)

AD-259 251 Div. 17
(11 July 61) OTS price $8.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
SOME PROBLEMS OF GREAT PLASTIC DEFORMATION IN METALS UNDER HIGH PRESSURES (Nekotoryye Voprosy Bol'shikh Plasticheskikh Deformatsiy Metallov Pri Vysokikh Devleniyakh),
by B. I. Beresnev, L. F. Vereshchagin and others. 9 May 61, 91p. incl. illus. tables, 52 refs. (Trans. no. MCL-880 of Akademii Nauk SSSR, Institut Fiziki Vysokikh Davlniy, Moscow: pp. 1-79, 1960)

Unclassified report

DESCRIPTORS: *Metals, Plasticity, Hydrostatic pressure, Pressure, *High pressure research, Extrusion, Metal forming presses, Hydraulic presses, Mechanical properties, Deformation, Plastic flow, Dies, Surface properties, Microstructure, USSR.

EFFECT OF HYDROSTATIC PRESSURE ON THE PLASTICITY OF METALS: Increase under pressure; Rupture of steel; Rupture of nonferrous metals; Area of the existence of linear dependence of the true deformation in rupture under pressure; Mechanical properties of metals under pressures up to 39,000 kg/sqcm- equipment; CONDITIONS OF THE OUTFLOW OF METALS FROM THE ORIFICE OF A DIE IN THEIR EXTRUSION BY A LIQUID UNDER HIGH PRESSURE: Two extrusion methods; Procedure; Role of the liquid medium; Surface quality; Speed; Pressure-Deformation relationship; Effect of die inlet angle size; Comparison of force systems (High pressure liquids vs plungers); Distribution of the deformation over the cross section of extruded rods. MECHANICAL PROPERTIES OF METALS EXTRUDED BY A HIGH-PRESSURE LIQUID: Mechanical properties of metals deformed under high hydrostatic pressures; Research procedure; Influence of deformation; Influence of pressure. TECHNOLOGICAL POSSIBILITIES OF THE EXTRUSION OF PARTS FROM METALS BY A LIQUID UNDER HIGH PRESSURE: Extrusion of parts with a complicated profile, and tubing; The hydraulic compressor.

AD-259 283 Div. 17, 25
(11 July 61) OTS price $.50

Defense Metals Information Center, Columbus, Ohio.
THE EMITTANCE OF STAINLESS STEELS,
by W. D. Wood, H. W. Deem, and C. F. Lucks.
12 June 61, 67p. incl. illus. 15 refs. (DMIC memo. no. 111)
Unclassified report

DESCRIPTORS: *Stainless steel, Heat transfer, *Thermal radiation, Reflection, Absorption, Measurement, Data, Test methods, Tables, Steel, Alloys.

A compilation is presented of original test data in the form of graphs on emittance, reflectance, and absorptance of stainless steels. The data were extracted from the literature published from 1940 to 1959 inclusive, and some 1960 literature. The data are separated according to material and to the type of measurement, whether spectral or total. The reference-information sheets accompanying each graph gives the names of the investigators and the reference from which the data were obtained. Notations of composition, surface condition of the test samples, and methods and conditions of measurement are given when available.

AD-259 284 Div. 17, 26
(11 July 61) OTS price $1.25

Defense Metals Information Center, Columbus, Ohio.
STATISTICAL ANALYSIS OF TENSILE PROPERTIES OF HEAT-TREATED Ti-4Al-3Mo-1V AND Ti-2.5Al-16V SHEET,
by G. H. Beatty and H. R. Ogden. 6 June 61, 1v. incl. illus. tables (DMIC rept. no. 46J)
(Contract AF 33(616)7747)
Unclassified report

DESCRIPTORS: *Titanium alloys, Tensile properties, Statistical analysis, Sheets, Rolling mills, Heat treatment, Aging, Aluminum alloys, Molybdenum alloys, Vanadium alloys, Mechanical properties.

In the solution treated and aged condition, Ti-4Al-3Mo-1V has a higher ultimate strength than does Ti-2.5Al-16V, but the two alloys are about even in yield strength and elongation. In the solution-treated condition, Ti-4Al-3Mo-1V is unquestionably stronger than Ti-2.5Al-16V. These conclusions are independent of producer. There is not much difference in the same alloy produced by different companies. The alloys developed under the Titanium-Alloy Sheet-Rolling Program would not endure the most critical interpretation of release property specifications. On the other hand, these alloys come reasonably close to specifications. A complete set of release property specifications is available only for specimens that have been solution treated and aged. Such specimens do not all exhibit the desired ultimate and yield strength, but the percentage of rejects is small enough to be encouraging. (Author)

AD-259 336 Div. 17, 13
(10 July 61) OTS price $1.25

Naval Civil Engineering Lab., Port Hueneme, Calif.
BLAST LOADING OF 8-FOOT ALUMINUM BEAMS.
Final rept.
by S. K. Takahashi and D. F. Green. 9 June 61, 42p. incl. illus. tables (Technical rept. no. 148)
(Proj. S-F013-04-05)
Unclassified report

DESCRIPTORS: *Aluminum, *Beams, Design, Tests.

Sixteen built-up beams fabricated from 5456-H311 and 5456-H321 aluminum alloy were tested under uniformly distributed static and blast loads. The beams had a clear span length of 8 feet 1-5/16 in. and an end fixity of 85%. Three beams were loaded statically to failure. The remaining beams were subjected to blast loads of smaller magnitude to determine the dynamic response. Buckling occurred after yielding in the lower flange and web adjacent to the supports of static and dynamic loads of 130 and 63 psi, respectively. Based on a yield load with a factor of safety of 1.65, design static and dynamic working loads of 64 and 29 psi respectively are recommended for the specific beams tested. A chart is included which may be used to predict the maximum deflection of a structural member in the plastic range under a long-duration load once the static properties are known. (Author)

AD-259 436 Div. 17, 27
(14 July 61) OTS price $1.10

Aerojet-General Corp., Azusa, Calif.
INVESTIGATION OF STRESS-CORROSION CRACKING OF HIGH-STRENGTH ALLOYS.
Informal progress rept. no. 8, 1-31 May 61, 30 June 61, 6p. incl. tables (Rept. no. L0414-01-8)
(Contract DA 04-495-ORD-3069)
Unclassified report

DESCRIPTORS: *Rocket cases, *Heat resistant alloys, Materials, *Corrosion research, *Corrosion, Stresses, Steel, Stainless steel, Titanium alloys, Fracture (Mechanics), Mechanical properties, Microstructure, Surface properties, Welding, Atmosphere, Corrosive liquids, Corrosive gases, Corrosion inhibition.

Bent-beam stress-corrosion test data are presented for 9 of the 11 environments on Vascojet 1000 and Ladish D6AC alloy steels, AM355 stainless steel, and B120VCA Ti alloy. The average air temperature was 73 F and the average relative humidity was 52%. Very few failures occurred with the bent-beam type specimens. U-bend test specimens are being prepared for conducting environmental stress-corrosion tests to provide supplemental data to the bent-beam tests.

AD-259 447 Div. 17, 25
(13 July 61) OTS price $2.60

Delaware U., Newark.
SELF-DIFFUSION IN DELTA IRON,
by Lars I. Staffansson and C. Ernest Birchenall.
Apr 61, 21p. incl. illus. table, 16 refs.
(Contract AF 49(638)872, Proj. 9760)
(AFOSR-733) Unclassified report

DESCRIPTORS: *Iron, *Diffusion, Measurement, Phase transitions, Iron alloys, Vanadium alloys, Transition temperature, Tracer studies.

Self-diffusion of Fe was measured in delta Fe between 1404 and 1518 C. Although the delta Fe results are adequately described by the equation D equals 0.019 exp (-42400/RT) sq cm per sec, in order to join these coefficients in a reasonable way with the self-diffusion coefficients of alpha Fe, it is necessary to introduce a curved line in the plot of logarithm of diffusivity versus reciprocal of absolute temperature. Although this

curved line diminishes the magnitude of the Curie point anomalies observed for self-diffusion in alpha Fe and probably for diffusion in Fe-V alloys, it does not appear that the excess vacancy formation energy arising from spin ordering is enough to account for the whole Curie point effect. Possible ways to obtain information about changes in the activation energy for vacancy motion are discussed. (Author)

AD-259 449 Div. 17, 26
(14 July 61) OTS price $.50

Defense Metals Information Center, Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS IN THE TECHNOLOGY OF MOLYBDENUM AND MOLYBDENUM-BASE ALLOYS.
Rept. for 1 Apr 60-30 June 61,
by J. A. Houck. 5 July 61, 3p. (DMIC memo no. 114)
Unclassified report

DESCRIPTORS: *Molybdenum, Heat treatment, *Molybdenum alloys, Production, Rolling mills, Melting, Sheets, Chemical properties, Explosive forming, Mechanical properties, Powder metallurgy, Hardness, Processing.

AD-259 569 Div. 17, 26
(13 July 61) OTS price $5.60

Westinghouse Electric Corp., Blairsville, Pa.
MOLYBDENUM FORGING PROCESS DEVELOPMENT.
Interim technical progress rept. no. 4, 15 Apr-15 June 61,
by J. Bonchak. 15 June 61, 55p. incl. illus. tables.
(Contract AF 33(600)41419, Proj. 7-756)
(ASC TR 7-756, vol. 4) Unclassified report

DESCRIPTORS: *Molybdenum alloys, *Forging, Manufacturing methods, Mechanical properties, Microstructure, Crystal structure, Grains (Metallurgy), Heat treatment, Deformation, Creep, Hardness, Melting, Electric arcs, Casting, Processing, Molybdenum, Titanium alloys, Zirconium alloys, Carbides, Nondestructive testing, Ultrasonics, Quality control.

A technique for the direct hot-work forging of arc-cast TZM alloy ingots was developed. Forging above 1950 C provides a working temperature range in which the plasticity of the material results in satisfactory workability. However, heating to temperatures above 1950 C tends to coarsen the grain structure and permits the formation of an undesirable carbide phase which adversely affects the strength properties. By resolution treating hot-worked material at 1900 to 1950 C and reworking in one heat, a change in size, and distribution of the carbide phase together with some grain refinement, results in outstanding high temperature strengths. After a controlled amount of cold work, room temperature strengths are greatly improved with little effect on the high temperature strengths. (Author)

AD-259 598 Div. 17
(14 July 61) OTS price $8.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
STRUCTURE AND MECHANICAL PROPERTIES OF ALLOYED FERRITE,
by M. M. Shteynberg. 21 Mar 61, 86p. incl. illus. tables, 10 refs. (Trans. no. MCL-599 of Problemy Metallovedeniye i Termicheskaya Obrabotka, Moscow, pp. 63-98, 1956)
Unclassified report

DESCRIPTORS: *Steel, Alloys, Mechanical properties, Crystal structure, Metallic crystals, Stresses, Plasticity, Deformation, Hardness, Heat treatment, Microstructure, USSR, Hardening, Iron, Phase studies.

CONTENTS:
The equilibrium state
Hardness and ultimate strength of the alloyed ferrite
Resistance of the alloyed ferrite to small plastic deformations
True stress diagrams of the alloyed ferrite
The effect of alloying elements on the brittle strength of ferrite
Influence of alloying elements on impact strength of ferrite
Nonequilibrium state
Recovery of alloyed ferrite in heating after cold plastic deformation
The strain hardening of alloyed ferrite with quenching
Recovery of alloyed ferrite during tempering

AD-259 601 Div. 17
(14 July 61) OTS price $8.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
COLLOID METALS,
by E. M. Natanson, 17 Mar 61, 92p. incl. illus. table (Trans. no. MCL-497 of Kolloidnyye Metally, Kiev, pp. 302-327, 1959)
Unclassified report

DESCRIPTORS: *Metals, *Alloys, *Colloids, *Friction, Magnetic properties, *Powder metals, Corrosion, *Corrosion inhibition, Rubber adhesives, USSR, Bearings.

Contents:
Antifriction properties of the dispersed phases in metal sols
The wear of a steel 45 ring rubbing against an MCI 38-60 bushing
The wear of an MCI 38-60 ring rubbing against an MCI 38-60 bushing
The wear of steel 45 rubbing against steel 45 and Cu
The magnetic properties of the dispersed phases of sols of metals and alloys
The use of highly dispersed metal powders in the machine building industry
Corrosion resistant highly-dispersed metallic powders
Structure-forming properties of dispersed phases of sols of metals in contact with rubber cement

AD-259 603 Div. 17
(14 July 61) OTS price $14.50

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
DIFFUSION PROCESSES IN ALLOYS (Protsessy Diffuzii V Splavakh)
L. M. Mirskiy. 3 Mar 61, 214p. incl. illus. tables (Trans. no. MCL-459 of Gosudarstvennoye Izdatel'stvo Oboronnoy Promyshlennosti, Moscow, 122p., 1959)
Unclassified report

DESCRIPTORS: *Heat resistant alloys, Alloys, Metals, *Diffusion, Microstructure, Lattices, Deformation, Phase transitions, *Nickel alloys, Iron alloys, Chromium alloys, USSR, Theory.

An investigation was made to determine the effect of the composition of heat-resistant alloys on diffusion mobility, the influence of refractory elements on the rate of the self diffusion processes, the influence of the structural condition of the alloy on the diffusion rate, and to obtain information on the mechanism of the diffusion process. A review of the literature is presented. Data are given on the influence of C, Al and Ti, W and Mo, and Al and Mo on the diffusion rate of Cr in Ni-base heat-resistant alloys. The results are discussed of a study of the effects of W, Mo, Nb, Ti, and V on the self diffusion of Fe in Fe-Ni alloy. Experiments are described on the effect of the structure of Ni-W alloy on the diffusion rate. Experimental data are discussed in relation to the diffusion mechanism and general conclusions are presented.

AD-259 607 Div. 17, 26
(17 July 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CASTING PROPERTIES AND SELECTION OF POURING METHOD FOR SCAB FORMING FUSIONS OF THE ZHS TYPE (Liteynye Svoystva I Vybor Sposoba Zalivki Plenoobrazuyushchikh Splavov Tipa ZHS),
by I. M. Khafuz. 9 June 61, 9p. (Trans. no. MCL-1001 of Gosudarstvennoye Nauchno-Tekhnicheskoy Izdatel'stvo Mashinostroitel'noy Literatury, Moscow, Leningrad, pp. 41-46, 1960)
Unclassified report

DESCRIPTORS: *Heat resistant alloys, Refractory materials, *Casting, Processing, Melting, Molding, Slags, Temperature, USSR, Oxidation.

The inclusion of slag in castings of ZHS (heat resistant) alloys containing Al and Ti is discussed, and methods for improving the quality of castings are described. These include the use of preheated molds and high pouring temperatures, centrifugal casting, and pouring directly to the mold from a batch type furnace without the use of a ladle.

AD-259 608 Div. 17
(17 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
EFFECT OF PLASTIC DEFORMATION ON THE ELASTIC PROPERTIES OF NICKELCHROME ALLOYS (Vliyaniye Plasticheskoy Deformatsii Na Uprugiye Svoystva Nikel'khrom Ovykh Splavov),
by T. Ya. Benieva. 5 June 61, 7p. incl. illus. (Trans. no. MCL-1002 of Izdatel'stvo Akademii Nauk Ukrainskoy SSR Kiev, pp. 62-67, 1960)
Unclassified report

DESCRIPTORS: *Chromium alloys, *Nickel alloys, Plasticity, Deformation, Elasticity, Ultrasonics, Ultrasonic properties, Measurement, Microstructure, USSR.

CONCLUSIONS: Experiments showed the possibility of utilizing ultrasonic rate measurements for the detection of texture and the degree of its formation in metals and alloys possessing the anisotropy of elastic properties. A reduction in the Young's modulus during plastic deformation in the case of Ni-Cr alloys is connected not only with the origination of texture, but, in all probability, is caused also by the destruction of the K-state. (Author)

AD-259 618 Div. 17, 26
(17 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
WELDING OF TECHNICAL MOLYBDENUM IN AN INERT ATMOSPHERE (Svarka Tekhnicheskogo Molibdena V Inertnoy Atmosfere)
by N. A. Ol'shanskiy and A. V. Mordvintseva. 2 June 61, 9p. incl. tables (Trans. no. MCL-946 of Avtomaticheskaya Svarka 10:36-41, 1960)
Unclassified report

DESCRIPTORS: *Molybdenum, *Arc welding, Controlled atmospheres, Sheets, Arc welds, Welded joints, Mechanical properties, Microstructure, Grains (Metallurgy), Argon, Fracture (Mechanics), USSR, Welding.

CONCLUSIONS: When welding sintered Mo in chambers with an Ar atmosphere, it was not possible to obtain good quality welded joints because of the formation of cracks. The introduction of Ti foil into the zone of the seam permitted a crackless welded joint, but its plasticity was low. When welding cast Mo in chambers with Ar atmosphere, the seams were free of cracks and had a good appearance. The strength of the welded joints at room temperature was 50 to 56% of the strength of the base metal. The strength at 250 C was 45 to 60% of the strength of the base metal at the same temperature. The plasticity of welded joints in cast Mo immediately after welding was low. By subsequent thermal processing in vacuo, it was possible to increase the plasticity of the base metal and welded joints at room temperature. Plasticity of the base metal and welded joints can be increased by removing the upper metal layers. (Author)

AD-259 624 Div. 17
(17 July 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
INVESTIGATION OF FORCES IN EXTRUSION OF RIBBED PANELS FROM ALUMINUM ALLOYS,
by R. I. Barbanel' and M. Z. Yermanok. 15 May 61, 14p. incl. illus. tables (Trans. no. MCL-922 of Tsvetnyye Metally 33:74-80, 1960).
Unclassified report

DESCRIPTORS: *Aluminum alloys, Airplane panels, *Extrusion, Metal forming presses, Design, Deformation, Plasticity, Stresses, Mathematical analysis, Airframes.

The principal parameters are defined which are necessary for analytically determining the forces necessary for the extrusion of a panel from a flat container. The forces necessary for extrusion were determined experimentally and compared with the computed values to determine the degree of accuracy of the derived formulas. The calculated values were from 7.5 to 21% greater than the forces determined experimentally.

AD-259 701 Div. 17, 31
(17 July 61) OTS price $9.10

Committee on Ship Structure, National Research Council, Washington, D. C.
(No Title).

Annual rept.
1 May 61, 101p. incl. illus. tables, 20 refs.
Unclassified report

DESCRIPTORS: *Ships, Design, Errors, Metals, *Materials, *Steel, Stresses, Corrosion, Ultrasonics, Fracture (Mechanics), Fatigue (Mechanics), Quality control, Tensile properties, Temperature, Thickness, Metallurgy, Handbooks, Alloys, Ship plates, Welding.

AD-259 739 Div. 17, 25
(18 July 61) OTS price $1.60

Naval Research Lab., Washington, D. C.
THE SLOW GROWTH AND RAPID PROPAGATION OF CRACKS.
Interim rept. on FBM Long Range Research and Development Program.
17 May 61, 11p. incl. illus. 12 refs. (NRL rept. no. 5617)
(Proj. RF 009-01-41-6051)
Unclassified report

DESCRIPTORS: *Fracture (Mechanics), *Sheets, *Cracking, *Steel, Stresses, Materials, Metals, Brittle materials, Metal plates, Tests, Mechanical properties, Test methods.

The application of fracture mechanics to crack-propagation testing and fracture of high-strength, thin-section materials has been examined in relation to the development of a fracture failure from a small semi-elliptical, surface crack origin. In the absence of environmental influences, slow crack growth will be appreciable only if the ratio of the fracture toughness for the thickness under consideration, K sub c, to the so-called plane strain fracture toughness, K sub Ic, exceeds a certain value. An expression for this lower-bound value has been developed. If the ratio does not exceed the lower bound, direct calculations of fracture stress from the initial crack dimensions and the K sub Ic value can be made. Otherwise, the Irwin criterion that the critical crack length must exceed twice the section thickness applies. Environmental effects are important but are normally a factor only in material selection and not in fracture mechanics calculations. (Author)

AD-259 767 Div. 17, 14
(19 July 61) OTS price $1.10

Horizons, Inc., Cleveland, Ohio.
STUDIES OF THE REINFORCEMENT OF METALS WITH ULTRA HIGH STRENGTH FIBERS (WHISKERS).
Bimonthly engineering progress rept. no. 3, 24 Mar-31 May 61.
by Bertram C. Raynes. 5 June 61, 8p. incl. table.
(Contract NOw-61-0207-c)
Unclassified report

DESCRIPTORS: *Metals, *Reinforcing materials, *Ceramic fibers, Bonding, Binders, Aluminum compounds, Oxides, Nickel alloys, Chromium alloys, *Powder alloys, Powder metallurgy, Processing, Physical properties, Tensile properties, Surface properties, Alloys, Mechanical properties, Fibers.

In studies of the reinforcement of high temperature metals and alloys with ultra high strength fibers (whiskers), the problem of developing a useful bond between the whisker and the metal matrix was the subject of primary concern. A procedure for incorporation of the fibers into the matrix has been developed. However, no significant improvements in tensile strengths have been observed in composites, indicating that the bond between the matrix and the reinforcing whisker is not transmitting the applied stress to the very much stronger fiber. Metallographic examination of the composites also reveals that no bond is being obtained. Means for improving the metal-to-fiber bond are now being studied. (Author)

AD-259 792 Div. 17, 26
(19 July 61) OTS price $1.10

Reactive Metals, Inc., Niles, Ohio.
THE MANUFACTURE OF Ti-7Al-12Zr SHEETS.
Bi-monthly rept. no. 9, 31 Dec 60-28 Feb 61, by J. K. Dietzel and S. R. Seagle. Mar 61, 5p. incl. tables.
(Contract NOa(s) 59-6229-c)
Unclassified report

DESCRIPTORS: *Heat resistant alloys, *Titanium alloys, *Sheets, Aluminum alloys, Zirconium alloys, Manufacturing methods, Production, Rolling mills, Cleaning, Pickling, Heat treatment, Tensile properties, Mechanical properties.

Tests on the Ti-7Al-12Zr 0.125-in. pilot run production sheet showed that the material had satisfactory properties in both the annealed, and annealed and thermally exposed conditions. One-half of the scheduled number of 0.040- and 0.125-in. sheets was rolled to final gage. In addition, one-half of the scheduled number of 0.063-in. sheets was rolled to breakdown gage (0.155-in.). (Author)

AD-259 795 Div. 17
(19 July 61) OTS price $1.60

Southern Research Inst., Birmingham, Ala.
AN INVESTIGATION OF THE CRACK-PROPAGATION RESISTANCE OF HIGH-STRENGTH ALLOYS AND HEAT-RESISTANT ALLOYS.
Bimonthly progress rept. no. 3, 23 Apr-23 June 61, by P. C. Jenkins and J. D. Morrison. 27 June 61, 14p. incl. illus. tables (Rept. no. 5024-1256-III)
(Contract NOw 61-0392-d)
Unclassified report

DESCRIPTORS: *Heat resistant alloys, *Molybdenum, *Molybdenum alloys, Titanium alloys, Carbon alloys, Zirconium alloys, Sheets, Refractory materials, Brittle materials, *Fracture (Mechanics), Tensile properties, Deformation, Aging, Transition temperature.

In the evaluations of the Mo sheet materials, emphasis was placed on locating brittle-ductile transition temperatures. Both the Mo + 0.5% Ti and the TZM (Mo + 0.5% Ti + 0.08% Zr) alloys had a transition temperature at 65 F. The transition temperature for unalloyed molybdenum was 150 F. In the investigation of the tensile and crack-propagation properties of the Mo alloys at elevated temperatures, no pronounced effects attributable to strain aging were found for the unalloyed Mo or the Mo--0.5% Ti alloy. However, the 0.2%-offset yield strength showed a slight maximum and the ultimate tensile strength showed a marked maximum at 1000 F for the TZM material. This was also accompained by a corresponding drop in net fracture stress at the same temperature. These effects are believed to be definitely the result of a strain aging phenomenon. (Author)

AD-259 815 Div. 17, 25
(19 July 61) OTS price $1.60

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
DISLOCATION CONFIGURATIONS IN PLASTICALLY DEFORMED POLYCRYSTALLINE Cu3Au ALLOYS.
Interim rept.
by B. H. Kear. June 61, 14p. incl. illus. 14 refs. (Rept. no. I-A2182-3)
(Contract Nonr-260800)

Unclassified report

DESCRIPTORS: *Copper alloys, *Gold alloys, Alloys, Crystal structure, Deformation, Plasticity, Lattices, Thin films, Crystals, Configuration.

Dislocation configurations observed in plastically deformed ordered and disordered alloys have been correlated with slip band structure. In the ordered alloy many of the residual dislocations in the superlattice lie approximately parallel to (110) directions. This effect is interpreted in terms of cross slip of screw dislocation pairs from the slip plane into a cube plane. (Author)

AD-259 840 Div. 17
(20 July 61) OTS price $.50

Defense Metals Information Center, Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS IN THE TECHNOLOGY OF COLUMBIUM AND TANTALUM,
Memo. rept. for Apr-June 61.
by E. S. Bartlett and F. F. Schmidt. 7 July 61, 4p. 11 refs. (DMIC memo. no. 115)

Unclassified report

DESCRIPTORS: *Niobium, *Niobium alloys, *Tantalum, *Tantalum alloys, Processing, Preparation, Additives, Mechanical properties, Tensile properties, Heat treatment, Powder metallurgy, Arc welding, Heat resistant alloys.

AD-259 921 Div. 17
(21 June 61) OTS price $15.00

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE PRODUCTION AND TREATMENT OF STEEL AND ALLOYS, SYMPOSIUM 38.
Nov 60, 1v. incl. tables, 127 refs. (Trans. no. MCL-595, pt. 2, pp. 228-456)

Unclassified report

DESCRIPTORS: *Steel, *Symposia, Alloys, Metallurgy, Processing, Phase transitions, Mechanical properties, Elasticity, Internal friction, Heat treatment, Corrosion, USSR, Microstructure, Crystallization, Metallic crystals, Stresses, Heat resistant alloys, Production.

Contents: Degassing of steel in ladles and molds by means of direct electric current; To the theory of metalloid solution in metals; Conditions of carbon transition into solid solutions during induction heating of chrome steel; Investigation of the decomposition kinetics and heat resistance of alloy KhN80T; Elastic properties of Fe-V alloys; Internal friction features in Fe-V alloys; Effect of tempering on the modulus of rigidity and the internal friction of hardened carbon steel; Variation of internal friction and natural oscillation frequency of type Kh18N9 steel samples during intercrystalline corrosion; Effect of small additions of B, Ca, Nb, Zr, and Ce on the structure and properties of a high-Ni heat-resistant alloy; Effect of cold working on the structure and properties of Ni-Cr heat resistant alloy EI437; On the problem of the recrystallization mechanism at critical strain; Stress investigation in polycrystals of AgCl by the polarization optical method; and Effect of tensile static and alternating stresses on the corrosion of 1Kh18N9 steel.

AD-259 943 Div. 17
(20 July 61) OTS price $.50

Defense Metals Information Center, Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS IN THE TECHNOLOGY OF HIGH-STRENGTH STAINLESS STEELS,
by D. A. Roberts. 14 July 61, 3p. (DMIC memo. no. 117)

Unclassified report

DESCRIPTORS: *Stainless steel, Processing, Sheets, Fracture (Mechanics), Heat treatment, Rolling mills, Precision finishing, Thickness, Fatigue (Mechanics), Steel, Titanium alloys, Mechanical properties, Rocket cases, Additives.

AD-259 986 Div. 17
(1 Aug 61) OTS price $.50

Defense Metals Information Center, Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS IN THE METALLURGY OF HIGH-STRENGTH STEELS,
by H. J. Hucek and A. R. Elsea. 21 July 61, 1p. (DMIC memo. no. 118)

Unclassified report

DESCRIPTORS: *Steel, Mechanical properties, Heat treatment, Processing, Austenite, Hardening, Temperature, Metallurgy.

# 18. MILITARY SCIENCES AND OPERATIONS

AD-259 133 Div. 18
(19 July 61) OTS price $1.60

Quartermaster Corps, Washington, D. C.
THE USE OF SCIENTIFIC METHODS IN SUPPLY MANAGEMENT,
by Andrew C. Stedry. 9 May 61, 21p. (Operational mathematics series no. 6)

Unclassified report

DESCRIPTORS: *Management engineering, *Supplies, *Logistics, Procurement, Mathematical analysis, Control, Job analysis, Engineering personnel.

The evolution of scientific techniques of supply management is sketched, and the reasons for employing them are discussed. The respective roles of the scientist, the management technologist, and the administrator are sharpened and clarified. (Author)

# Division 19 - NAVIGATION

AD-259 453 Div. 18, 28, 23, 8
(14 July 61) OTS price $9.10

Technical Military Planning Operation, General Electric Co., Santa Barbara, Calif.
THREAT EVALUATION AND ACTION SELECTION FOR THE 1965-1975 STRATEGIC ENVIRONMENT. TASK I. HUMAN FACTORS STUDY,
by William Dossett. 1959, 98p. incl. illus. 113 refs. (Rept. no. RM 59TMP-54)
(Contract AF 19(604)5881; In cooperation with California U.)
(AFCRC TR 59-196(3)) Unclassified report

DESCRIPTORS: *Behavior, *Information theory, *Human engineering, *Stress (Psychology), Model tests, Control systems, *Computers, Group dynamics, Speech transmission, Social communication, Leadership, Sociometrics, Emotions, *Reaction (Psychology), Selection, Theory, *Strategic Air Command, *War potential, *National defense.

The purpose of this report is to make a preliminary analysis of man as a possible component in a threat evaluation and action selection system (TEAS). The major objective of TEAS is to function as a specialized strategic deterrent system operating to mitigate the threat posed by premeditated attack. In general, the system will be capable of detecting the existence of, and evaluating the nature and magnitude of any threat posed by a potentially hostile nation. Furthermore, the capabilities of the system will enable the selection of an appropriate set of counteractions based on a previously formulated graduated commitment of response doctrine. (Author)

AD-259 454 Div. 18, 32
(14 July 61) OTS price $1.60

Technical Military Planning Operation, General Electric Co., Santa Barbara, Calif.
THREAT EVALUATION AND ACTION SELECTION FOR THE 1965-1975 STRATEGIC ENVIRONMENT. TASK I. POWER DIFFUSION AND MILITARY STRATEGY,
by D. Hekhuis, C. Cody, and H. Goss. 1959, 13p. 17 refs. (Rept. no. RM 59TMP-56)
(Contract AF 19(604)5881)
(AFCRC TR 59-196(5)) Unclassified report

DESCRIPTORS: *Political science, Economics, Nuclear weapons, Production, Quality control, *National defence, Power, Theory, *Foreign policy, Sociology, *Economic warfare, Europe, USSR, Japan, India, Analysis, Selection, Fear, *Strategic Air Command, *War potential.

AD-259 667 Div. 18, 15
(17 July 61) OTS price $2.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
MOVEMENT OF MILITARY OPERATIONS. CENTERS OR OTHER MILITARY INSTALLATIONS AS SAFEGUARD AGAINST NUCLEAR ATTACK,
by Josef H. Halberstein. 5 May 61, 26p. incl. illus. (Rept. no. 22G-0071)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: *Nuclear warfare, Warfare, *Evasion, *Military mobilization, Military research, Military operations, *Statistical analysis, Probability, Calculus of variations, Operations research.

A major military installation is subject to concentrated nuclear or conventional attack if detected by the enemy. Frequently, it is proposed to make installations mobile, as protection against such attacks. However, the operation of the center is disturbed by moving it. In this report the loss in the operative value of a center is defined in terms of the time it stays in one location, the time required for moving it from one location to another and a time constant of destruction which measures the degree of hostility of the environment. It is shown that it is possible to minimize the loss, by judicious choice of the time of operation. This optimum time depends on the time required for moving and the time constant of destruction; however, it will be relatively insensitive to errors in estimating the time constant of destruction. (Author)

# 19. NAVIGATION

AD-259 257 Div. 19
(11 July 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
DESCRIPTION AND INSTRUCTIONS FOR MARKER BEACON MRM-48.
24 Apr 61,38p. incl. illus. tables (Trans. no. MCL-861 of Opisaniye I Instruktsiya Markernogo Radiomayaka Tipa ''MRM-48'', pp. 1-67).
Unclassified report

DESCRIPTORS: Instruction manuals, Antennas, Circuits, *Radio beacons, Transmitter receivers, Voltmeters, Landing aids, Glide path systems.

AD-259 358 Div. 19, 6, 12
(18 July 61) OTS price $4.60

Hazeltine Electronics Corp., Little Neck, N. Y.
DEVELOPMENT OF TRANSISTORIZED RADAR BEACONS C-BAND, AN/DPN-57(XE-1) AND X-BAND, AN/DPN-58(XE-1).
Final technical rept. 29 May 58-1 Apr 61,
by Joseph F. Havel. 1 Apr 61, 41p. incl. illus. (Rept. no. 10069)
(Contract DA 36-039-sc-77985, Proj. 3-16-08-301)
Unclassified report

DESCRIPTORS: C band, X band, *Radar beacons, Transistors, Airborne, Remote control systems, Guidance, *Guided missiles, *Pilotless aircraft, Radar tracking, Reliability, Radar pulses, Design, Tests, *Radar navigation, Electronic circuits, Radar equipment.

Efforts were made to develop C-band and X-band radar beacons. These equipments are airborne pulse type remote control and/or tracking aids for mounting in rocket propelled missile or remote controlled aircraft. The equipment is designed to respond to coded pulse interrogation from several non-synchronized radars as used in a chain radar guided missile system. Receiver design followed along the lines of the feasibility model (AN/DPN-31) except for improved transistor types and an additional gain stage. In general the design of the decoder and power supply, followed along the feasibility model

design with some improvements made as the state of the art allowed. The potted module packaging concept proved successful, as no major problems were encountered in conforming to the extreme environmental specifications. The over-all effort produced a beacon design that, while expensive, did meet all of the important requirements of the original specifications. (Author)

AD-259 559 Div. 19
(13 July 61) OTS price $4.60

Shufeldt, Henry H., Annapolis, Md.
PRECISION CELESTIAL NAVIGATION EXPERIMENTS.
Report of Celestial Observations taken at Key West, Florida,
by Henry H. Shufeldt. June 61, 46p. incl. illus.
(Contract Nonr-244900)
Unclassified report

DESCRIPTORS: *Celestial navigation, Instrumentation, *Sextants, Telescopes, Tests, Visibility, Climatic factors, Experimental data.

This study is summarized as follows: (1) The 20 x 50 mm prismatic monocular of good manufacture, is superior to any sextant telescope of lesser power during daylight hours. It reduces the random errors in a series of observations, as its great magnification permits the greatest nicety of obtaining contact between the body and the horizon. It is entirely satisfactory for use aboard ship except in extremely bad conditions of wind and sea. (2) Similarly the 7 x 50 mm prismatic monocular is superior to any other telescope available for test when the horizon is poorly defined, due to darkness. (3) A dip meter, fitted with a high power telescope, and capable of determining empirically the value of the dip to one-tenth of a minute of arc is an essential adjunct to the sextant, where accuracy is of primary importance. (Author)

AD-259 766 Div. 19, 12, 30
(19 July 61) OTS price $4.60

General Precision, Inc., Pleasantville, N. Y.
DOPPLER VELOCITY FOR SPACE NAVIGATION.
Final engineering rept. Mar 59-Feb 61,
by S. Benjamin. June 61, 35p. incl. illus. tables.
(Rept. no. A18-14)
(Contract AF 33(616)5487)
(ASD TR 61-155) Unclassified Report

DESCRIPTORS: *Spaceships, *Space navigation, *Space flight, *Doppler navigation, Recording devices, Radio astronomy, Velocity, Hydrogen, Tracking, Interstellar matter, Magnetic tape, *Radiofrequency spectrum analyzers, Design, *Magnetic recording systems.

A study was made of doppler velocity measuring techniques for space navigation. The purpose was to investigate experimentally the feasibility of space velocity determination by measuring the doppler shifts in the 21-cm (hydrogen) absorption line. The work accomplished includes the design and construction of both a recorder-analyzer and a frequency tracker. The recorder-analyzer processes the hydrogen line signal and provides a down-converted version of this signal for recording on magnetic tape; the analyzer portion performs a spectrum analysis on either the direct or the recorded signal. The frequency tracker measures and follows the center frequency of the absorption line. The results described demonstrate in a qualitative manner the feasibility of utilizing the doppler shift in the 21-cm radiation for space velocity measurements. Some of the techniques developed are applicable to the entire field of radio astronomy. (Author)

AD-259 826 Div. 19, 12
(19 July 61) OTS price $11.00

Raytheon Co., Sudbury, Mass.
INVESTIGATION OF ACTIVE DOPPLER VELOCITY SENSOR.
Quarterly engineering rept. no. 4, 1 Mar-31 May 61. June 61, 135p. incl. illus. (Rept. no. AED-444)
(Contract AF 33(616)7388)
Unclassified report

DESCRIPTORS: *Doppler navigation, *Doppler radar, *Radar navigation, *Space navigation, Velocity, *Spaceships, Hypervelocity vehicles, Space flight, Space probes, Moon, *Lunar probes, Landing, Modulators, Power supplies, Radar pulses, Radar beacons, Radar tracking, Radar equipment, Airborne, Flight testing, Radar ranges, Radiofrequency filters, Microwave amplifiers, Amplifiers, Plasma physics, K band, Sidebands, Design.

Long pulse modulator and power supply design problems were investigated and the effects of power supply regulation on the Long pulse sideband distribution were considered. Development and testing of a PRF tracker and coherent transponder continued. The theory of spectral compression was modified and airborne equipment reworked for the second series of flight tests. Ranging techniques for the lunar landing requirement were considered and the most promising one selected for laboratory investigation. Optimum filtering studies and the development of a frequency tracker (incorporating the results of optimum filtering studies) continued. The 35 kmc receiver measurements were obtained from the laboratory model of the 13.5 kmc parametric amplifier. Effort also continued on the wide dynamic range IF amplifier. The calculations on the effects of the plasma sheath on Doppler navigator operation were completed. (Author)

AD-259 865 Div. 19, 12
(21 July 61) OTS price $6.60

Aerospace Corp., El Segundo, Calif.
AN INTRODUCTION TO INERTIAL GUIDANCE CONCEPTS FOR BALLISTIC MISSILES (A TUTORIAL REPORT),
by David W. Whitcombe. 15 Mar 61, 57p. incl. illus. tables (Rept. no. TDR-594(1990)TN-1)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: *Guided missiles, Guidance, *Inertial guidance, Errors, Velocity, *Guided missile trajectories, Control systems, Navigation computers, Gyroscopes, Measurement, Accelerometers, Mathematical analysis, Surface to surface.

Various aspects of guidance and control for ballistic missiles are presented. A discussion of the required velocity vector is given with several examples based upon the flat earth model. Error analysis procedures involving inertial reference and measurement systems are treated in some detail. Missile steering techniques are approached in such a way that stability is not a problem. Procedures for insuring that the missile velocity will be controlled to the required velocity without payload loss penalties are given. This is accomplished by introducing trajectory-shaping functions that cause the guided ballistic missile to closely follow the nominal reference trajectory. The steering discussion initially assumes a point mass missile. Control system complications that result from actual missile dynamics are also treated. (Author)

# 20. NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

AD-259 169 Div. 20
(11 July 61) OTS price $7.60

Bendix Corp., Cincinnati, Ohio.
FIBER RADIACMETER IM-122( )/PD.
Quarterly progress rept. no. 1, 1 July-31 Oct 60. 31 Oct 60, 72p. incl. illus. tables (Rept. no. R-60-CDE-01-6)
(Contract DA 36-039-sc-84986)
Unclassified report

DESCRIPTORS: Radiation counters, *Radiation instruments, *Dosimeters, *Monitors, Radiation alarms, Design, Transistors, Power supplies, Electrometers, Sensitivity, Fibers, Tests, Mathematical analysis, Storage batteries, Battery chargers.

The design of the fiber radiacmeter IM-122 ()/PD was divided into 3 paralleling efforts. These are: (1) the rate-indicating function complete with zero surveillance, (2) the power supply and associated battery charger, and (3) housing and exterior controls. The design plan considers each of the primary functions both independently and in their proper relationship. Correlating functions were studied from the standpoint of maximum utility as well as performance. Efforts were concentrated on the radiation rate detection and indicating function. Experimental studies coupled with a mathematical analysis are given with a view toward determining optimum boundary values for all parameters. A transistorized dc to dc converter type of power supply was designed. Detailed procedure for the design and construction of the engineering test model of the radiameter is presented. (Author)

AD-259 228 Div. 20
(10 July 61) OTS price $10.50

Illinois U., Urbana.
DEUTERON COMPTON EFFECT.
by Roger S. Jones. June 61, 134p. incl. illus. tables, 45 refs. (Technical rept. no. 25)
(Contract Nonr-183405)
Unclassified report

DESCRIPTORS: *Deuterons, *Compton effect, Deuteron cross sections, Electrons, *Nuclear reactions, Protons, Proton cross sections, Proton reactions, Compton scattering.

Contents:
Experimental equipment
Experimental setup
Liquid deuterium target
Deuteron detection system
Cerenkov counter
Magnet calibration
Electronics
Experimental procedure
Preliminary tests
Main experiment
Film analysis
Results
Efficiency calculation for deuteron Compton effect
Efficiency calculation for neutral pi meson production
Comparison with theory and discussion
The proton and general considerations
The deuteron problem
Appendix A. Theoretical formulae for deuteron Compton effect cross section
Appendix B. Details of electronic circuitry
Appendix C. Betatron energy and yield

AD-259 317 Div. 20, 25, 15
(11 July 61) OTS price $10.10

Maryland U., College Park.
LECTURES ON THE USE OF PERTURBATION METHODS IN DISPERSION THEORY,
by Richard J. Eden. 1961, 128p. incl. illus. 46 refs. (Technical rept. no. 211)
(Contract AF 49(638)24)
(AFOSR-773)
Unclassified report

DESCRIPTORS: *Perturbation theory, *Nuclear physics, Particles, Nucleons, Mesons, Pions, Meson scattering, *Scattering, Transport properties, Complex variables.

Contents:
Analytic structure in elementary particle physics
Mathematical methods for the study of singularities of amplitudes in perturbation theory
Functions of two complex variables
Singularities of the general fourth order amplitude
The Mandelstam representation for a general term in perturbation theory
Acnodes and cusps on Landau curves
Production amplitudes and unitarity

AD-259 361 Div. 20, 17
(11 July 61) OTS price $.50

Naval Research Lab., Washington, D. C.
EFFECT OF IRRADIATION TEMPERATURE ON NEUTRON-INDUCED CHANGES IN NOTCH DUCTILITY OF PRESSURE-VESSEL STEELS,
by L. E. Steele and J. R. Hawthorne. 28 June 61, 9p. incl. illus. (NRL rept. no. 5629)
Unclassified report

DESCRIPTORS: *Steel, *Radiation damage, Transition temperature, Brittle materials, Temperature, Pressure vessels, *Nuclear power plants, Water, Liquid cooled, Neutrons, Dosage, Reactor cores, Neutron bombardment, High temperature research, Physical properties.

In order to study the effects of elevated irradiation temperatures upon the shift (increase) in the ductile-to-brittle transition temperature of two pressure-vessel steels, an experimental assembly containing four groups of specimens was irradiated. Four different irradiation temperatures, 260, 400, 450, and 550 F, were maintained for a one-month irradiation period. Post-irradiation evaluation of specimens indicated no significant temperature effect for the materials irradiated at less than 450 F. There was a significant effect as a result of irradiation at 550 F, the shift being roughly 100 F less. The transition-temperature shifts for materials irradiated at less than 450 F were in good agreement with data from 19 earlier experiments in which the specimen temperatures during irradiation were less than 200 F. (Author)

AD-259 381 Div. 20, 9
(10 July 61) OTS price $1.25

University of Southern Calif. Engineering Center, Los Angeles.
AN ELASTIC COLLISION MODEL FOR THE KINETIC THEORY OF GASES,
by Toyoki Koga. June 61, 38p. incl. illus. (Rept. no. USCEC 83-206)
(Contract AF 49(638)831)
(AFOSR-823)
Unclassified report

DESCRIPTORS: Kinetic theory, *Gases, Energy, *Particle trajectories, Particles, Distribution, Mathematical analysis, Integration.

From investigation of studies of impact phenomena of various types of particles and considering the convenience of kinetic theoretical treatment of gases, a semi-empirical model of elastic collisions is proposed. With respect to encounters of charged particles, binary collision is defined in a new sense. In this model, the collision probability (total cross section) of two particles may be a function of their relative velocity. With respect to a gas composed of two or more types of particles, partitions of momentum and of energy after collisions are plausibly determined, and the conditions which secure the stability of the Maxwell distribution are considered. By this model, analytical treatments of the Boltzmann equation are simplified. The equation may be solved without losing the main characteristics of the pertinent phenomena, even when the state of a gas deviates considerably from thermal equilibrium. (Author)

AD-259 430 Div. 20
(14 July 61) OTS price $4.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
IRRADIATION OF SEMIRAD AT GODIVA II (27, 28 AUGUST 1959),
by Harry M. Murphy, Jr. 15 Feb 61, 48p. incl. illus. tables, 17 refs. (ASRDL technical rept. no. 2185)
(Proj. 3A99-20-001-02)
Unclassified report

DESCRIPTORS: *Ionization chambers, Gamma rays, *Coaxial cables, Radiation effects, Tests, *Dose rate, *Dosimeters, Test methods, Radioactivity, Fast neutrons, *Test reactors, Measurement.

Experiments are described which were performed on the Godiva II reactor with the use of ionization chamber Semirad systems. The experiments are concerned mainly with the problem as to how close the recorded Godiva pulse agrees with the actual burst. For this purpose, the Semirad results were compared with readings from a parallel-plate ion chamber and from fluor dose-rate meters. A theoretical comparison was made of the Godiva pulse with experimental data. The influence of the burst on coaxial lines used to transmit the Semirad signal was also investigated. The results affirm the ability to Semirad to follow the Godiva II gamma pulse at the closest possible distances. (Author)

AD-259 440 Div. 20
(14 July 61) OTS price $2.60

Radiation Effects Information Center, Columbus, Ohio.
MONTHLY ACCESSION LIST 47.
May-15 June 61.
15 June 61, 22p. (REIC Accession List no. 47)
(Contract AF 33(616)7375, Proj. 4458)
Unclassified report

DESCRIPTORS: *Bibliography, *Radiation effects, Electronic systems, Polymers, Metals, Lubricants, Ceramic materials, Dosimeters, Space environmental conditions, Test facilities, Electronic equipment.

Contents:
Electrical and electronic systems
Polymers
Lubricants and fluids
Metals and ceramics
Dosimetry
Facilities
Space environment

AD-259 500 Div. 20
(14 July 61) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
RADIATION SHIELDING FOR MANNED SPACE FLIGHT,
by Lewis E. Wallner and Harold R. Kaufman, July 61, 45p. incl. illus. tables, 56 refs. (Technical note no. D-681)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-681.

DESCRIPTORS: *Shielding, *Radiation hazards, *Space flight, Space medicine, Reactor hazards, Reactor shielding materials, Reactor shielding calulations, Van Allen radiation belt, Solar flares, Cosmic rays, Astrophysics, Manned.

Cosmic radiation, solar flares, the Earth's Van Allen belts, and nuclear radiation are assessed. For the Mars mission, cosmic and solar-flare radiations may require biological-shield weights of 100,000 lb. Shield needs for the nuclear reactor and the Van Allen belts are an order of magnitude less than this except for slow traversal of the Earth's radiation belts. Much weight can be saved if a common mass can be utilized against all radiation hazards. For early space experiments, major solar flares probably constitute the prime radiation hazard. A partial body shield may possibly be designed with adequate radiation protection for 100 lb per man. (Author)

AD-259 521 Div. 20, 16
(12 July 61) OTS price $3.60

Ohio State U. Research Foundation, Columbus.
EFFECT OF X-IRRADIATION ON BLOOD CELLS AND TISSUES.
Final rept. 1 Oct 52-30 June 61,
by Milton A. Lessler. 30 June 61, 28p. incl. illus. 24 refs. (Rept. no. 513-F)
(Contract DA 49-007-md-293)
Unclassified report

DESCRIPTORS: Cells (Biology), *X-rays, *Radiation effects, Tissues (Biology), Metabolism, *Radiation damage, Cytochemistry, Histological sections, Biophysics, Respiration, Glycolysis, Blood sugar, Blood chemistry, *Blood, Blood plasma, Blood forming organs, *Radiation tolerance, *Radiobiology.

Research was undertaken to determine the effects of low levels of X-irradiation on the cytophysiology of blood cells. Evidence of cytological, histochemical, and biophysical changes are related to the changes in respiratory activity of frog and amphiuma red cells noted following X-ray doses of 100 r and 200 r in vitro. Recent studies of X-ray damage to frog blood cells at the

electron microscope level of resolution are presented in detail. The metabolism of freshly prepared and blood-bank stored human erythrocytes were incubated in autogolous plasma or physiological saline solution was compared. Erythrocyte respiration and glycolysis was greater in plasma than in saline. Glycolysis of unirradiated and 700 r X-irradiated red cells was approximately equal in the normal range of blood glucose levels, but at higher or lower glucose levels in vitro X-irradiation inhibited glycolysis. Exposure of blood-bank stored erythrocytes to X-ray doses of 700 r or 1400 r did not materially alter their respiratory activity. A comparison of the endogenous respiration of rat liver and spleen slices after in vitro X-irradiation of 300 r and 1200 r is reported. (Author)

AD-259 638 Div. 20, 32
(17 July 61) OTS price $11.00

Union Coll., Schnectady, N. Y.
DYNAMIC SIMULATION OF MULTI-PASS PRESSURIZED WATER NUCLEAR POWER PLANTS BY ANALOG COMPUTER TECHNIQUES.
Master's thesis
by J. O. Brondel. June 61, 130p. incl. illus. 69 refs. (APAE memo. 288)
(In cooperation with Alco Products, Inc., Contract DA 44-192-eng-7)
Unclassified report

DESCRIPTORS: *Analog computers, Nuclear power plants, *Pressurized water reactors, Simulation, Analysis, Heat transfer, Programming, Computers, Steam, *Reactor control.

A kinetic model of the primary loop of a multi-pass pressurized water reactor power plant is developed to evaluate, by analog computer techniques, the transient response characteristics due to steam generator load and reactor as a typical plant, transient behavior patterns are illustrated and examined for a variety of load inputs, variations in plant contstants, and analog model simplifications. (Author)

AD-259 671 Div. 20, 16
(17 July 61) OTS price $1.60

Material Lab., New York Naval Shipyard, Brooklyn.
THE INFLUENCE OF TIME ON THE DEATH OF HeLa CELLS AT ELEVATED TEMPERATURES.
Final rept.
by George Mixter, Jr., Guy P. deLhery and others. 19 Dec 60, 17p. incl. illus. tables (Lab. Proj. no. 5046-16, pt. 11)
(DASA-1209) Unclassified report

DESCRIPTORS: Cells (Biology), *Radiation effects, Tissues (Biology), *Skin, *Thermal radiation, *Radiation injuries, Radiobiology, Temperature.

The time required to kill HeLa cells in suspension was determined for the range of temperatures from 48 to 65 C. The cells were placed between 6-micron films of polyethylene 50 microns apart. One side of this chamber was placed in a well-stirred water bath at the elevated temperature for the desired time and then held in a bath at 37 C for 15 minutes. Eosin-Y, mixed with the cell suspension before exposure, stained the cells affected by the elevated temperature episode and distinguished live from dead cells. The time (t) to cause death of the HeLa cells was found to range from 1 second at 65 C to 1900 seconds at 48 C. (Author)

AD-259 677 Div. 20, 31
(17 July 61) OTS price $1.60

Naval Radiological Defense Lab., San Francisco, Calif.
SHIP SHIELDING FACTORS. COMPUTATIONAL METHOD COMPARED TO EXPERIMENTAL RESULTS.
by L. G. Haggmark. 7 June 61, 21p. incl. illus. tables (Research and Development technical rept. no. NRDL TR-514)
Unclassified report

DESCRIPTORS: *Shielding, Ships, Gamma rays, Experimental data, Theory, Computers, *Radioactive fallout, Dose rates, Aircraft carriers, Penetration, Dosimeters.

A previously developed computational method is used to obtain the ratios of the gamma-radiation dose rates at given interior points of a light aircraft carrier to the dose rate 3.5 feet above the center of the Flight Deck which is assumed to be covered uniformly with Co-60. The results of the computations are compared with values determined by an experiment on the ship where the Flight Deck was uniformly contaminated with Co-60. The comparison is made for two portions of the ship which have different structural components. The results of the comparison show the computed values to be higher than the experimental values and generally within 28 percent in the relatively open portion of the ship and generally worse than 50 percent in the more heavily compartmentalized portion of the ship. (Author)

AD-259 711 Div. 20
(18 July 61) OTS price $4.60

Battelle Memorial Inst., Columbus, Ohio.
EXPERIMENTAL AND RESEARCH WORK IN NEUTRON DOSIMETRY.
Final summary rept. on Phase 1, 1 July 60-28 Feb 61,
by H. C. Gorton, O. J. Mengali and others,
31 Mar 61, 40p. incl. illus. tables.
(Contract DA 36-039-sc-78924)
Unclassified report

DESCRIPTORS: *Dosimeters, *Neutron detectors, Measurement, Thermal neutrons, Gamma rays, Fast neutrons, Radiation instruments, Tests, Radiation counters, Detectors, Sensitivity, Silicon, Crystals, Life expectancy, Design, Calibration, Packaging, Radioactivity.

Research was concerned with the development of a dosimeter system which will ultimately provide the Army with a capability for measuring fast-neutron dosage in terms of biological damage to personnel exposed to nuclear radiation under tactical conditions. Four areas investigated were material supplier, minority-carrier lifetime in the material before processing, modifications of the processing technique to retard degradation of lifetime in processing the device, and the width of the base region of the detector. The results of experiments on devices made from high-resistivity silicon, low-oxygen-content silicon, and with a deep p-p+ junction showed that none of these innovations resulted in a significantly improved device. An annealing treatment of selected detectors exposed to a fast-neutron dose of 1178 tissue rads resulted in the recovery of greater than 90% of the preirradiation characteristics. The relative scatter in the lifetimes of the 15 detectors studied in this experiment decreased appreciably after annealing above 250 C. Brief consideration was given to package requirements imposed by the electronic, radiological, environmental and physical properties of the detector. (Author)

AD-259 719 Div. 20
(18 July 61) OTS price $8.10

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
A NUCLEAR REACTOR FACILITY SAFETY INSPECTION GUIDE.
Master's thesis,
by Leon Ellington McKinney. Feb 61, 88p. incl. illus., 60 refs. (Rept. no. GNE 61-13-Phys.)
Unclassified report

DESCRIPTORS: Nuclear reactions, *Safety, *Nuclear power plants, Design, *Maintenance, *Maintenance personnel, Operation.

A detailed safety inspection guide is proposed for use by the Air Force in inspecting its nuclear reactor facilities. Even though nuclear reactors and systems should be designed so as to be safe, it is not possible to attain a 100% foolproof design. The philosophy of inspection is discussed, both in general terms and in specifics dealing with reactor facilities. The conduct of an inspection is discussed, along with the importance of the human element in nuclear reactor safety. In order to better effect an understanding of the problem of safety inspection, inspection procedures currently in use by the A.E.C. are explained as well as self-inspection programs employed by contractors. The present Air Force organizational structure for its safety inspection program and the various inspections of a reactor facility through its first year of operation is discussed in detail. Then, proposed procedures with which the Air Force could effect its facility inspection program are put forth and discussed at some length. The detailed inspection guide for the areas of operations and maintenance at a reactor facility, is described with the problem in a chronological sequence. (Author)

AD-259 721 Div. 20, 25
(18 July 61) OTS price $3.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
A FAST NEUTRON COUNTER USING SEMICONDUCTOR DIODES AND CC NCIDENCE CIRCUITRY.
Master's thesis,
by Carl Lawrence Rucker. Mar 61, 40p. incl. illus. 8 refs. (Rept. no. GNE/Phys/61-16)
Unclassified report

DESCRIPTORS: *Neutron counters, *Semiconductors, Diodes, *Coincidence counting, Counting methods, *Neutron detectors, Ionization chambers, Radiation counters, Pulse height analyzers, Silicon, Solid state physics, Circuits, Measurement, Neutrons, Deuteron bombardment, Van DeGraaff generators, Neutron flux density, Design, Tests.

Silicon solid-state detectors were used in conjunction with coincidence circuitry to detect and measure the energies of charged particles resulting from a Li6(neutron, alpha)H3 reaction. 5.24 Mev neutrons were obtained by bombarding deuterium gas with 2 Mev deuterons from a 2 Mev Van De Graaff. A chamber was designed and constructed permitting the preparation, measurement, and the positioning of a Li-6 foil between the 2 silicon detectors without breaking the vacuum. A resolution of 578 Kev and a counting efficiency of 4 x 10 to the -8th power were obtained where efficiency equals counting rate/neutron flux. (Author)

AD-259 722 Div. 20, 25
(18 July 61) OTS price $4.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
DESIGN OF A SOURCE FOR A LARGE-SCALE ENVIRONMENTAL GAMMA IRRADIATION TEST FACILITY USING MIXED ISOTOPES.
Master's thesis,
by John J. McGee, Jr., Mar 61, 46p. incl. illus. tables, 16 refs. (Rept. no. GNE/Phys/61-12)
Unclassified report

DESCRIPTORS: Gamma emission, *Gamma rays, *Radioactivation analysis, Radiochemistry, Isotopes, Cobalt, Cesium, Europium, Dose rate, Gamma neutron reactions, Beta particles, Radiation damage.

A design of a source for a large-scale, environmental, gamma-irradiation, test facility using the isotopes Cobalt-60, Cesium-137, and Europium-152 has been accomplished. The source geometry is a six-foot diameter vertical disk with 1,627small sources mounted in the disk. These small sources are cylinders containing the three isotopes and are mounted with their axes parallel to the axis of the disk. An arbitrary test item with a four foot diameter face, centered on this source, six inches away is exposed to a dose rate of 1.3 x 10 to the 8th power ergs/hr-g(C) at its center. The exposure rate is only eight percent less at the edge of the test item face two feet off the center line. The source contains 705,000 curies of Co-60, 1,030,000 curies of Cs-137, and 545,000 curies of Eu-152 and generates heat at the rate of 49,800 BTU/hr. The Co-60 is irradiated Cobalt with a specific activity of 2.9 curies/gm.; the Cs-137 is a processed fission product formed into CsCl powder with a specific activity of 22.0 curies/gm.; and the Eu-152 is irradiated $Eu_2O_3$ with a specific activity of 14.8 curies/gm. (Author)

AD-259 723 Div. 20
(18 July 61) OTS price $8.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
THEORETICAL ANALYSIS OF A CYLINDRICAL FAST REACTOR CONTAINING CONCENTRIC ANNULAR VOIDS.
Master's thesis,
by James H. Mann, Mar 61, 98p. incl. illus. tables, 34 refs. (Rept. no. GNE/Phys/61-11)
Unclassified report

DESCRIPTORS: *Atomic energy engineering, Fast neutrons, *Fast reactors, Transport properties, Prompt neutrons, Thermal column, Uranium, Molybdenum, Reactor cores, Reactor fuels, Fission, Mechanical properties, *Research reactors.

Engineering estimates are presented for a proposed fast, pulse-type reactor. The reactor consists of a layered structure of thin-walled concentric cylinders composed of uranium and 10% by weight molybdenum. Design requirements and the advantages of the proposed design over existing facilities are discussed. The Multigroup Asymptotic Transport Method is used to determine the material buckling and clean-cold critical mass of solid, bare, cylindrical cylinder, which serves as a base for the proposed design. Based on the maximum thermal expansion that occurs throughout the operating temperature ranges, the optimum size of the shells and coolant channel voids is determined. A central channel, to provide a means for pulsing the assembly, and the annular cooling voids are introduced into the core

and the effects of same are analyzed. Then, a new critical mass is computed. Performance characteristics during a pulsing cycle are computed, based on the maximum allowable temperature rise, and compared to the performance of Godiva II. In all cases, the proposed facility indicates a decided improvement over the existing prototypes in its operating capabilities. (Author)

AD-259 803 Div. 20
(19 July 61) OTS price $1.60

Army Engineer Reactors Group, Fort Belvoir, Va.
PRELIMINARY INVESTIGATION OF SM-1 CONTROL ROD SEAL FAILURE,
by G. W. Knighton. 18 Apr 61, 13p. incl. illus. (Rept. no. OSB 15)

Unclassified report

DESCRIPTORS: Research reactors, *Control rods, Rods, Neutron absorbers, *Seals, *Metal seals, *Reactor safety systems, Reactor control, Chromium plating, Corrosion, Failure (Mechanics), Nuclear power plants.

On 26 March, the SM-1 plant experienced excessive control rod drive seal leakage rate. During a vapor container entry for instrumentation check, the leakage rate from each seal was measured. The maximum rate was found to be 6.3 gallons per hour compared to a normal value of approximately .7 gph. Two seals were replaced with rebuilt assemblies. This reduced leakage rates to an allowable operating rate. Shim no. 3 seal was found plugged, and back flushing eliminated the plugging. Visual inspection of the disassembled Rod-B seal indicated leakage increase was due to the increased clearance probably caused by overheating due to loss of cooling water at various times in the operating period. (Author)

AD-259 857 Div. 20, 25
(21 July 61) OTS price $5.60

Aerospace Corp., El Segundo, Calif.
THE ELASTIC SCATTERING OF LOW ENERGY ELECTRONS BY THE SLATER ORBITAL ATOM,
by Lawrence Baylor Robinson, 13 Mar 61, 51p. incl. illus. tables (Rept. no. TDR-594(1203-01) TR-1)
(Contract AF 04(647)594)

Unclassified report

DESCRIPTORS: *Elastic scattering, Electrons, *Atomic orbitals, Nuclear models, Uranium, Rubidium, Cesium, Density, Tables.

The potential between an electron and a static atom is fomulated on the basis of screening-constant-type wave functions, as are characteristic of the Slater orbital atom. Universal functions are constructed so as to characterize any atom with atomic number Z from 1 to 86. The low energy elastic scattering properties of atoms are investigated on the basis of such a potential, and the cross sections are calculated for all of the atoms from Z = 1 to 86. The results are compared with those which the writer obtained with the Thomas-Fermi model of the atom. Results are given for the cross sections as a function of energy, in some specific cases. Qualitative agreement between theory and experiment results from such calculations. A polarization potential must be added to static atom potentials in order to obtain quantitative agreement between theory and experiment. (Author)

AD-259 902 Div. 20, 14
(24 July 61) OTS price $1.75

Ballistic Research Labs., Aberdeen Proving Ground, Md.
EFFECTIVENESS OF LINING MATERIALS IN INCREASING THE BLAST RESISTANCE OF A SIMULATED OUTER CONTAINMENT VESSEL FOR A NUCLEAR REACTOR,
by J. W. Hanna and W. O. Ewing, Jr. Apr 61, 46p. incl. illus. tables (BRL memo. rept. no. 1341)
(Proj. no. 503-04-002)

Unclassified report

DESCRIPTORS: Reactor hazards, *Research reactors, *Nuclear power plants, Blast, Shock waves, *Shock resistance, Vibration isolators, Pressure tanks, Spheres, Pentolite, Glass textiles, Rubber, Materials, Shock, Attenuation, Coatings, Insulating materials, Tests, Test methods, Textiles, Steel, Structural shells, Stresses, Containers.

A five-foot-diameter, spherical, thin-walled, steel shell, simulating a nuclear reactor outer containment vessel, was lined with three different shock absorbing materials and subjected to internal blast loading from Pentolite explosive charges. Strain-time histories of shell response were measured with strain gages on the shell's outer surface. Peak strains generated in the lined shells were approximately one-half those recorded with the same shell when unlined. The results suggest the feasibility of increasing the blast resistance of outer containment vessels of nuclear reactors through the use of a suitable lining material. (Author)

AD-259 991 Div. 20
(24 July 61) OTS price $2.60

Naval Radiological Defense Lab., San Francisco, Calif.
THE ACTIVATION OF SODIUM, MANGANESE AND ALUMINUM IN NEVADA TEST SITE SOIL,
by F. M. Tomnovec. 21 Feb 61, 30p. incl. illus. tables (NRDL-TR-500)

Unclassified report

DESCRIPTORS: *Soils, *Neutron activation, Sodium, Manganese, Aluminum, *Radioactivation analysis, Radioactive fall-out, Radioactivity, Thermal neutrons, Gamma rays.

An attempt was made to duplicate the soil neutron activation data taken during past nuclear weapon field operations, by the use of a laboratory source of neutrons. The neutron source was a beryllium target bombarded by 12-Mev protons at the 60-in. cyclotron at the University of California in Berkeley. Samples of sodium, manganese, and aluminum were irradiated while buried at various depths in a drum filled with Nevada Test Site soil (NTS). The resultant activated isotopes Na24, Mn56, and Al28 are shown to be activated in a manner similar to data taken at nuclear weapon field tests using similar samples. The data also indicate that 10 to 20 percent of the induced activity in the samples was caused by neutrons above the cadmium cutoff energy of 0.4 electron volts. From the data we were able to calculate the resonance integrals of sodium, manganese, and aluminum. (Author)

# 21. NUCLEAR PROPULSION

AD-259 244 Div. 21, 1
(11 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
AIRCRAFT NUCLEAR POWER PLANTS (Atomnyye Aviatsionnye Dvigateli),
by Ya. Yu. Malodorskiy and E. V. Rovinskiy.
1 May 61, 4p. incl. illus. (Trans. no. MCL-932 of Teoriya Aviatsionnykh Dvigateley Chasty I. Osnovy Termodinamiki i Gazovoy Dinamiki, Moscowipp. 29-32, 1960)
Unclassified report

DESCRIPTORS: *Aircraft nuclear propulsion, USSR, Turbojet engines, Nuclear propulsion, Nuclear power plants.

AD-259 589 Div. 21, 25, 1
(14 July 61) OTS price $5.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
NUCLEAR REACTOR AS THE OBJECT OF CONTROL,
by B. S. Voronkov. 23 Mar 61, 52p. incl. illus. tables (Trans. no. MCL-842 of Avtomaticheskoye Regulirovaniye Aviadvigateley, Sbornik Statey, pp. 66-106, 1960)
Unclassified report

DESCRIPTORS: Nuclear propulsion, *Aircraft nuclear propulsion, Technological intelligence, USSR, *Control systems, Differential equations, Fission neutrons, Heat transfer, *Thermodynamics, Thermal neutrons, Transport properties, Mathematical analysis.

The nuclear reactor on neutron power is described by a nonlinear differential equation of the seventh order. For examining the thermal state of the reactor and the effect of the temperature coefficient of the reactivity, it is necessary to take into consideration also the reactor equation for temperature. When there are little deviations from the position of equilibrium it is permissible to linearize the nonlinear differential equation of the reactor. With relation to perturbations by an excess coefficient of reactivity the reactor which does not have a temperature coefficient of reactivity is astatic. With the presence in the reactor of a negative temperature coefficient of reactivity, its properties are substantially changed. The reactor takes on the property of temperature autoregulation. The regulating organ with the aid of which the action on the mode of operation of the reactor is accomplished (absorbing rods), possesses a nonlinear characteristic: the absorbing capacity of the rod depends nonlinearly on the depth of its insertion in the active zone or the reflector.

AD-259 663 Div. 21, 12
(17 July 61) OTS price $6.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
THE SPLIT SCATTER SHIELD FOR SPACE APPLICATIONS.
Master's thesis,
by John O. Berga. Mar 61, 54p. incl. illus. tables (Rept. no. GNE/Phys/61-2)
Unclassified report

DESCRIPTORS: *Aircraft nuclear propulsion, *Shielding, Gamma rays, Neutrons, *Spaceships, Scattering, Design, Nuclear power plants, Nuclear propulsion.

The split scatter shield consists of multiple shield sections which are separated from each other. When this type of shield is used outside the atmosphere, radiation scattering in each section has a high probability of escaping the shield system without rescattering. Consequently, this shield has been proposed as a replacement for the normal shield unit construction for space applications. The split shield is compared with a unit shield of the same weight and material in a hypothetical problem situation by computing the radiation attenuation by each. The problem is computed using point and circular source geometries assuming the sources to emit gamma rays only. The calculations are performed using simplifying assumptions so that computer programs are not necessary. A geometrical parameter study is performed for the split shield to determine the optimum number of sections, the optimum separation distance between sections, and the maximum flux attenuation. The results indicate that a split shield is capable of greater flux attenuation by a factor of more than four than a unit shield of the same weight. (Author)

# 22. ORDNANCE

AD-259 057 Div. 22
(5 July 61) OTS price $2.60

Mellon Inst. of Industrial Research, Pittsburgh, Pa.
BALLISTIC PROTECTIVE BUOYANT MATERIALS.
Quarterly rept. no. 5, 14 Jan-31 Mar 61,
by M. C. Jaskowski. 26 May 61, 20p. incl. illus. tables.
(Contract N140(138)68879B, Proj. 388-2)
Unclassified report

DESCRIPTORS: *Body armor, *Armor, *Synthetic fibers, Fibers, *Orlon, *Dacron, *Wire screens, Glass textiles, Laminates, Resins, Metallic textiles, Steel, Antipersonnel ammunition, Projectiles, Penetration, Effectiveness, Test methods, Test equipment, Ballistics, Terminal ballistics, Coatings, Moistureproofing, Protective clothing, Buoyant materials, Fragmentation ammunition.

Unbonded staple-fiber batts were observed as impeding projectile penetration by causing it to tumble as well as increasing its effective size by wadding. Batts prepared from steel staple fibers were ineffective as ballistic armor. High-tensile wire screen in conjunction with an Orlon staple fiber batt increases the protective ability of the batt only when it is placed behind the fibers. The ballistic test method was modified by replacing the Al witness plate with a device capable of accurately determining the velocities of the projectiles which completely penetrate the armor samples. Using this technique, data were obtained and plotted for samples of 1.0 dpf Orlon staple fiber batts, 1.5 dpf Dacron staple fiber batts and Doron body armor. (Author)

# Division 22 - ORDNANCE

AD-259 084 Div. 22
(5 July 61) OTS price $4.60

Ammunition Group, Picatinny Arsenal, Dover, N. J.
INVESTIGATION AND SCREENING OF M17 PROPELLANT PRODUCTION FOR LOTS SUBJECT TO POOR LOW TEMPERATURE BALLISTIC PERFORMANCE.
Final engineering rept.
by Kenneth H. Russell and Herbert M. Goldstein.
June 61, 72p. incl. illus. tables (Technical rept. no. DB-TR: 7-61)

Unclassified report

DESCRIPTORS: *Propellants, Test methods, Quality control, Low temperature research, Manufacturing methods, Combustion, Ballistics, Production, Propellant grains, Microphotography, Tests, Temperature.

Closed bomb tests were an effective technique for evaluating low temperature ballistic characteristics of M17 propellant. Conventional laboratory analysis failed to detect abnormalities in the propellant grains. Propellant lots tested were representative of: (1) vintage and manufacturer, (2) manufacturing technique, and (3) caliber. Lots made before the process variable studies conducted at government owned, contractor-operated plants in 1954 gave the difficulties. Lots made after 1954 generally gave satisfactory results. Disposition of the 250 propellant lots, essentially all the M17 propellant production prior to 1958, were recommended. (Author)

AD-259 350 Div. 22
(10 July 61) OTS price $7.60

Ammunition Group, Picatinny Arsenal, Dover, N. J.
EVALUATION OF BLOWBACK IN THE 3.5 INCH ROCKET, M28A2,
by D. Eliezer, E. Huselton, and S. Kaplowitz.
June 61, 67p. incl. illus. tables (Technical rept. no. DB-TR: 4-61)
(Proj. WO: 6509-11)

Unclassified report

DESCRIPTORS: *Rockets, Rocket igniters, *Rocket launchers, *Blast, Rocket propellants, Tests, Deterioration, Storage, Temperature, Launching, Training ammunition, High explosive ammunition, Exhaust gases, Gas masks, Protective clothing, Ballistics, Resistance, Military personnel, Gas mask facepieces, *Safety.

Blowback on firing 3.5 inch rockets at temperatures less than 70 F is inherent in the design and does not reflect an aging problem. The 3.5 inch rockets, M28A2 (HEAT) and M29A2 (practice) are considered satisfactory for flight firing at all temperatures down to -20 F provided the M9A1 gas mask is worn for face and eye protection. The ballistic stability of both lots is considered good. The small ballistic differences found are not considered significant. Resistance failures were found in 3.0-4.5% of the samples tested. All M28A2 rockets in the field should be tested periodically for compliance with resistance requirements; non-complying rockets should be removed from service. Resistance failures showed no correlation with blowback. (Author)

AD-259 416 Div. 22
(13 July 61) OTS price $1.10

Army Arctic Test Board, Fort Greely, Alaska.
EVAULATION OF MODIFIED FEED SYSTEM FOR GUN, MACHINE, 7.62mm, M60.
10 July 61, 3p. (Proj. no. 2922)

Unclassified report

DESCRIPTORS: *Automatic weapons, *Small arms, *Feed mechanism, Loader, Tests, Analysis, *Guns.

The M60 Machine Gun was equipped with the test item, with 100 rounds of ammunition in a T-7 bandoleer attached, weighed 1.2 lbs. less than an M60 Machine Gun equipped with the current mounting bracket and canvas magazine filled with 100 rounds of ammunition. Approximately 12,000 rounds were fired from each of four M60 machine guns equipped with modified feed systems. The ammunition was fed from various containers that were not attached to the gun.. No interference from the hook on the modified systems was noted. No difference in the ease of attachment of a loaded T-7 bandoleer to the hooks was observed. The Type A Modified Feed System, when used in conjunction with a bandoleer identical to the Machine Gun Bandoleer, T-7, was superior to the mounting bracket-canvas magazine combination used on the Gun, Machine, 7.62mm, M60, and is suitable for Army use. The Type B Modified Feed System for the Gun, Machine, 7.62mm, M60, is not suitable for use with the Gun, Machine, 7.62mm, M60. The design of the Machine Gun Bandoleer, T-7, is suitable for use with the Type A Modified Feed System for the Gun, Machine, 7.62mm, M60. However, this bandoleer lacks the desired durability. (Author)

AD-259 444 Div. 22, 6
(12 July 61) OTS price $1.60

Diamond Ordnance Fuze Labs., Washington, D. C.
X-BAND RADAR CROSS-SECTIONAL AREA MEASUREMENTS OF 81-MM AND 105-MM MORTAR SHELLS AND 105-MM ARTILLERY ROUND,
by Fabian T. Liss. 25 May 61, 11p. incl. illus.
(DOFL rept. no. TR-945)
(DOFL Proj. 10110)

Unclassified report

DESCRIPTORS: *Mortar shells, *Projectiles, X Band, *Radar targets, Radar equipment, Superhigh frequency, Tests, Test methods, Measurement, *Radar echo areas, Radar reflections.

Cross-sectional area measurements were made upon the 81-mm and 105-mm mortar shells and the 105-mm artillery round through limited viewing angles. A description of the measuring techniques used is included. On the basis of the limited viewing angles and a rough integration of the data taken, the radar cross section of the 105-mm mortar appears to be approximately 1 sq. ft. while that for the 81-mm mortar and 105-mm artillery rounds appears to be about 6 db below this figure. (Author)

AD-259 641 Div. 22, 10
(17 July 61) OTS price $1.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
CHEMICAL DECOMPOSITION OF STABILIZED PROPELLANTS,
by L. DeAngelis and G. F. Gardin. Apr 61, 19p. incl. illus: tables, 10 refs. (BRL Memo. rept. no. 1339)

Unclassified report

DESCRIPTORS: *Nitrocellulose, *Nitroglycerin, *Guanidine nitrates, *Propellants, *Rocket propellants, *Solid rocket propellants.

*Decomposition, Stability, Safety, *Reaction kinetics, Additives, Temperature, Storage, Spectrophotometers, Spectrographic analysis.

The decomposition chemistry of stabilized propellants is shown to be a two-step pseudo first-order reaction in stabilizer with the second step rate-determining. The experimentation was designed to consider only that portion of the decomposition curve representative of propellant safe life. Chemical kinetics are used to develop the mechanism of reaction which is substantiated by experimental proof. This information is basic for calculating the Arrhenius energy of activation so that quantitative values for propellant safe life may be obtained. (Author)

AD-259 694 Div. 22
(17 July 61) OTS price $1.60

Ordnance Mission, White Sands Missile Range, N. Mex.
LITTLEJOHN. SALT FOG TEST,
by Will E. DeBusk. June 61, 16p. incl. illus. (Technical memo. no. 878)
(Proj. TU2-1038)
Unclassified report

DESCRIPTORS: *Rockets, *Rocket launchers, Corrosion inhibition, Resistance, *Rocket igniters, Ignition circuits, Tests, Rocket motors, Chemical warheads.

One Littlejohn Rocket, XM51, and associated equipment, with inert motor and inert XM8 warhead and launcher (XM34, SN5), were subjected to an environment of salt fog at White Sands Missile Range, New Mexico. The objective of this test was to determine if the Littlejohn rocket and launcher were resistant to corrosion caused by salt fog. Conclusions and recommendations are given concerning the launcher, rocket, blanket, and igniter circuit tester. Ten illustrations of corroded components and one illustration of a damaged component are included. (Author)

AD-259 743 Div. 22
(18 July 61) OTS price $1.60

Frankford Arsenal, Philadelphia, Pa.
ENGINEERING INFORMATION ON FERROUS ELECTRODE AND AUXILIARY WIRES FOR DEPOSITING WELDED OVERLAY ROTATING BANDS,
by H. J. Addison, Jr. May 61, 12p. incl. illus. tables (Test rept. no. T61-11-1)
Unclassified report

DESCRIPTORS: *Rotating bands, Projectiles, Welds, Electrodes, *Wire, Iron, Mechanical properties, Coatings, Specifications, Tensile properties, Tests, *Welding rods, Processing, Welding, Materials, Arc welding, Electric arcs.

The report contains information for preparing a specification on ferrous filler wires for welded overlay rotating bands. Engineering data are presented on wire diameter, tensile strength, and chemical composition. Wire variables including surface finish, spooling, and coatings are discussed. Additional information should be obtained, particularly in connection with wire coatings and tensile strength. (Author)

AD-259 749 Div. 22
(18 July 61) OTS price $5.60

Ogden Air Materiel Area, Hill Air Force Base, Utah.
SERVICEABILITY OF BOMB EJECTION CARTRIDGE MLU-2/C.
Airmunitions test rept.,
by Joseph W. Holden. June 61, 51p. incl. illus. tables (Rept. no. OOY TR 61-29)
Unclassified report

DESCRIPTORS: *Ejector cartridges, *Bombs, Sensitivity, Tests, Test methods, Detonators, *Release mechanisms, *Electric detonators.

The MLU-2/C bomb ejection cartridge is used in a dual bomb release mechanism. The pair of cartridges are arranged so that the functioning of either cartridge will release the bomb. Tests were conducted to evaluate the serviceability of a representative sample from 4 lots of MLU-2/C cartridges. Tests were conducted for no-fire sensitivity and 50% fire current (Bruceton Test Method) on Air Force inventory. Tests were also conducted to determine the effects on the E77 blasting cap bridge wire after being subjected to the sensitivity test. Test data from the representative samples indicated that the serviceability of the 4 lots was excellent and fulfilled the specification requirement of a no-fire sensitivity test of 2 amp for 5 minutes. (Author)

AD-259 796 Div. 22
(19 July 61) OTS price $2.60

Texaco Experiment Inc., Richmond, Va.
THE USE OF THERMOELECTRIC MATERIALS IN ELECTRICAL INITIATORS.
Quarterly technical progress rept. no. 4, 1 Mar-31 May 61, by H. B. Forney and Wendall J. Clark. 1 June 61, 21p. incl. illus. table (Rept. no. TM-1264; EXP 342)
(Contract N178-7736)
Unclassified report

DESCRIPTORS: *Electric igniters, Design, *Electric detonators, Ignition, Igniters, *Semiconductors, *Thermoelectricity, Tests, Tellurides, Heating, Materials.

It has been demonstrated experimentally that semiconductor materials can be applied to generate substantial Peltier thermoelectric effects applicable to making a radio-frequency-proof squib. Temperature ratios (Tdc/Tac) ranging up to 4 have been demonstrated for equal magnitudes of direct and alternating currents. It was shown also that approximately twice as much alternating current in place of direct current would be required to effect a temperature rise of 200 C above ambient. The making of Peltier-type igniters appears to require some additional development and engineering. (Author)

AD-259 904 Div. 22, 30
(24 July 61) OTS price $3.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
A DOUBLE-CHARGE TECHNIQUE TO MEASURE FACE-ON BLAST,
by W. Olsen and J. Wenig. May 61, 39p. incl. illus. tables, 11 refs. (BRL memo. rept. 1347)
(Proj. 503-04-002)
Unclassified report

DESCRIPTORS: *Blast, *Shock waves, Explosives, Pressure, Measurement, Instrumentation, Tests, Test methods, Pentolite, Pressure gages, Simulation, Air blast, Test equipment, Piezoelectric gages, Piezoelectric transducers, Detonation, *Explosions.

Measurements were made of air blast parameters at the midpoint of a line joining 2 equal weight explosive charges. The explosive used was 50/50 Pentolite with dual 1 or 8 lb spheres being detonated simultaneously. The pressure transducer employed was a BRL pancake pressure gage employing a synthetic piezoelectric ceramic as the sensing element. A satisfactory simulation of reflection of a blast wave from a rigid wal was obtained. The pressure-time histories of the colliding waves were measured using gages which were developed for side-on blast experiments. These measurements agree with data obtained by other techniques. The data constitutes the first direct measurements with calibrated gages, of the pressure-time history of a face-on blast at scaled distances as small as Z = 1.5 ft/lb (1/3). (Author)

AD-259 948 Div. 22, 8
(21 July 61) OTS price $1.60

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
THE ANALYSIS OF ELECTRONIC TIMING CIRCUITS,
by Philip Zirkind. July 61, 17p. incl. illus.
(Technical notes no. FRL TN 47)
(Proj. TS1-200)
Unclassified report

DESCRIPTORS: *Electronic circuits, *Timing circuits, *Antitank ammunition, Mines, *Land mines, Fuzes, *Mine fuzes, Counting methods, *Delay circuits, Capacitors, Mathematical analysis, Firing circuits, Firing mechanisms.

Research is concerned with antitank land mines with fuzing techniques which will: (1) distinguish between tanks and other vehicles or personnel, and (2) initiate the mine when a tank is in the most vulnerable position over the mine. The second requirement demanded that the fuze count tank bogey wheels by impact and release until the proper number have passed over it, and then fire. The circuit functions in such a way that each bogey wheel impact transfers a quantity of charge till fire voltage is attained. The method of computing the charge accumulated after n transfers is described. It was concluded that an electronic counting circuit can be utilized to initiate any voltage-sensitive device. The circuit can be pre-set to function for any number of events and to deliver any voltage compatible with the system requirement. Of the circuit parameters, the capacitor functions like a ladle to transfer the charge, and hence its capacity determines the number of counts. The other capacitor serves as a reservoir and determines the final voltage available. (Author)

## 23. PERSONNEL AND TRAINING

AD-259 389 Div. 23
(11 July 61) OTS price $6.60

Personnel Lab., Wright Air Development Div., Lackland Air Force Base, Tex.
JOB ANALYSIS IN THE UNITED STATES AIR FORCE,
by Joseph E. Morsh, Joseph M. Madden and Raymond E. Christal. Feb 61, 59p. 27 refs.
(Proj. 7734)
(WADD TR 61-113) Unclassified report

DESCRIPTORS: *Air Force, *Job analysis, Management engineering.

The Air Force has recently revised the Occupational Analysis Manual which prescribes procedures for job analysis and evaluation. The revised method of job analysis, including the research and development which has led to its present form, is described in this paper. The method centers around the use of the task inventory, while at the same time it includes many of the more desirable features of traditional methods. The uses of job analysis data, statistical treatment, and special problems for future research are discussed. Evidence shows that the method will produce reliable information and will permit economical sampling of many job incumbents. The method also facilitates quantitative analysis and the organization of information into a form of utility to a maximum number of using agencies. (Author)

AD-259 898 Div. 23
(24 July 61) OTS price $1.60

Air Force Proving Ground Command, Eglin Air Force Base, Fla.
PERFORMANCE EVALUATION OF NUCLEAR WEAPONS MECHANICAL SPECIALISTS. GRADUATES OF ATC COURSE ABR46330,
by Grey L. Adams. June 61, 17p. incl. tables.
(APGC TR 61-30)
(Proj. 998HL47)
Unclassified report

DESCRIPTORS: Nuclear weapons, *Training, Operation, Job analysis, *Personnel, Test equipment, Handling, Literature, Spray nozzles, Aviation personnel, *Maintenance personnel, *Military training, Achievement tests.

This evaluation was conducted to determine the ability of nuclear weapons mechanical specialists graduating from ATC ABR46330 to perform the duties of their specialty. The performance of two groups of apprentices working in an operational environment was evaluated for a 90-day period, utilizing Chennault AFB, Louisiana, and Stony Brook AFS, Massachusetts, as the test sites. Two apprentices were assigned to Chennault and five to Stony Brook. This arrangement offered test situations in both SAC and AFLS environments. After two to four weeks on the job, both groups of apprentices were capable of performing the duties required in the majority of their assignments. The over-all reaction of the apprentices and supervisors to the course was favorable, and the training content of the course was considered generally adequate. Recommended training improvements included more extensive use of applicable technical publications, hand tools, and handling equipment. Additional training on test equipment, maintenance procedures and the reading of schematics was also recommended. Both supervisors and apprentices felt that the use of the spray gun should be discontinued as the time required to become proficient in its proper use is excessive. An extensive field survey at both bases indicated that the the spray can was favored by a considerable margin over the more expensive, complicated, skill-requiring spray gun. (Author)

AD-259 993 Div. 23, 30
(24 July 61) OTS price $8.60

Philco Corp., Philadelphia, Pa.
INVESTIGATION OF COMPUTER TECHNIQUES FOR RADAR

LAND MASS SIMULATION,
by Alan S. Corson. Nov 60, 91p. incl. illus.
(Contract N61339-790)
(Technical rept. NAVTRADEVCEN 790)
Unclassified report

DESCRIPTORS: *Radar target position simulation, *Digital systems, Digital computers, Analog computers, Flight paths, Radar, Mapping, Training devices, Terrain, Flight simulators, Analog to digital converters.

A study is give for digital simulation of radar land mass. It is intended to define the problem of digital simulation and to determine the feasibility and practicality of using available techniques and/or equipment in the solution of the problem. Terrain elevation and radar reflectivity characteristics are stored digitally on magnetic tape for a 300 n mi x 1000 n mi problem area. Data is transferred from this raw storage to an intermediate storage level to provide for availability of the entire radar viewing area for all range scales. New data is accessed and the center of scan of intermediate storage is located as a function of simulated aircraft motion by the flight trainer. The x-y coordinates digital information is converted to analog form for final storage in a cathode ray storage tube. Methods of digitizing elevation and reflectivity data and the applicability of current components and techniques to the solution of the problem is investigated. Based on the technical approach followed in the study program, digital techniques are feasible but not yet practical for land mass simulation. (Author)

## 24. PHOTOGRAPHY AND OTHER REPRODUCTION PROCESSES

AD-259 802 Div. 24, 12, 18
(19 July 61) OTS price $19.75

Aeronutronic, Newport Beach, Calif.
STUDY OF SPACE PHOTOGRAPHIC PROGRAM USING PROBE-TYPE MISSILES.
Final engineering rept.
by T. A. Bergstralh, J. H. Atkinson, Jr. and others. 14 June 61, 301p. incl. illus. tables.
(Publ. no. U-1268)
(Contract AF 33(616)7643)
Unclassified report

DESCRIPTORS: *Aerial photography, *Space probes, Space environmental conditions, Aerial cameras, *Aerial reconnaissance, Research test vehicles, Mapping, High altitude, Atmosphere, Photographic intelligence, Flight testing, Surface targets, Position finding, *Satellite vehicles, Research program administration, Military intelligence, Instrumentation, *Launching sites, Test facilities.

Research is concerned with the effects of atmospheric and environmental parameters on space photography, and the planning of an experimental program for instrumenting probe-type vehicles to evaluate these parameters. The available experimental and theoretical data relating to atmospheric optical effects were reviewed, and the analyses of these effects extended to space based photographic reconnaissance systems. An experimental program encompassing 26 probe flights progressively instrumented with cameras up to 120 inch focal length and with supporting equipment is outlined. The major objective of the experimental program is to measure photographic parameters over continental land masses under varying atmospheric conditions. To meet these requirements a preliminary design was prepared for a 2 stage solid propellant probe vehicle with a stabilized payload section capable of operation to 400 naut mi apogee altitudes within the confines of the White Sands Missile Range. This vehicle and the alternative employment of the Air Force Blue Scout vehicle at the Atlantic Missile Range is discussed. (Author)

# Division 25 - PHYSICS
# 25. PHYSICS

AD-259 058 Div. 25, 20
(5 July 61) OTS price $2.60

Midwest Research Inst., Kansas City, Mo.
DEVELOPMENT OF SYSTEMS FOR AUTOMATIC, REVERSIBLE CONTROL OF INTENSITY OF VISIBLE RADIATION THROUGH TRANSPARENT MATERIALS.
Progress rept. no. 1, 2 Jan-31 Mar 61,
by Florence I. Metz. 14 Apr 61, 15p. incl. illus. tables.
(Contract NOw 61-0587-d)
Unclassified report

DESCRIPTORS: *Optical filters, *Optical materials, *Semiconductors, Reflection, Light transmission, Thin films, Thermal radiation, Infrared radiation, Ultraviolet radiation, Light, Absorption, *Semiconducting films, Atomic bomb explosions, Nuclear explosions, *Shielding.

Attempts are being made to prepare a glazing material which restricts the amount of radiant energy transmitted during a period of high energy density (such as the excursion resulting from a nuclear weapon). The objective of this program is the preparation of a material with controllably variable transmission and reflection characteristics. Thin multilayer films composed of inorganic semiconductors, ultraviolet absorbers, and photochromic materials have been shown to be moderately successful as controllable optical filters. Data are presented on the transmission and reflection characteristics of these filters. (Author)

AD-259 060 Div. 25, 4
(5 July 61) OTS price $9.10

Metal Hydrides, Inc., Beverly, Mass.
SPECTROGRAPHIC ANALYSIS OF SEMICONDUCTOR AND RELATED MATERIALS.
Final rept.,
by James M. Morris. 14 Mar 61, 122p. incl. illus. tables, 1316 refs.
(Contract AF 19(604)3469)
(AFCRL-369)
Unclassified report

DESCRIPTORS: *Semiconductors, *Spectrographic analysis, Chemical impurities, Impurities, Test methods, *Chemical analysis, Determination, Quantitative analysis, Separation, *Bibliography, Silicon, Sensitivity, Metallic compounds, Salts.

This report includes:
BIBLIOGRAPHY OF ANALYTICAL METHODS FOR THE DETERMINATION OF SMALL AMOUNTS OF ALUMINUM, ANTIMONY, ARSENIC, BORON, GALLIUM, GERMANIUM, INDIUM, PHOSPHORUS AND SULFUR IN HIGH PURITY SILICON, by A. P. Scanzillo. 14 Mar 61.
(Contract AF 19(604)3469)

Spectrographic techniques were developed for the analysis of trace impurities in semiconductor and related materials. Various chemical concentrational procedures and spectrographic techniques were investigated. The analytical methods of activation analysis, solid mass spectrometry, and emission spectroscopy were refined to give specific determinations in the parts per billion range. Considering cost and the availability of a reactor, emission analysis offers the widest and most practical application.

AD-259 096 Div. 25, 8
(5 July 61) OTS price $8.60

Applied Research Lab., Sylvania Electronic Systems, Waltham, Mass.
ELECTRODYNAMIC STUDY OF MAGNETIZED CURRENT CARRYING PLASMA.
Final rept.
by G. N. Joshi. 14 Apr 61, 91p. incl. illus. 23 refs. (Rept. no. F478-1)
(Contract AF 19(604)7305)
(AFCRL-350)
Unclassified report

DESCRIPTORS: *Plasma physics, Magnetic fields, *Magnetohydrodynamics, Electron beams, Electromagnetic waves, Plasma oscillations, Gas ionization, Propagation, Space charges, Noise (Radio), Mathematical analysis, Electrons, Ions, Harmonic analysis, Integral transforms, Waveguides, Bessel functions.

A linear macroscopic electrodynamic analysis of a fully ionized, collisionless, magnetized electron-ion drifting and/or stationary plasma was carried out. The analysis suggests 2 possible mechanisms which will convert the dc energy of the drifting plasma to the electromagnetic energy and vice versa. The first mechanism involves the interactions between the circularly polarized transverse electromagnetic waves supported by an unbounded plasma which streams along the ambient magnetic field through an ambient stationary plasma. The other mechanism is based on the coupling between the quasi-transverse electromagnetic waves and the quasi-longitudinal space charge waves supported by a bounded plasma which drifts along the ambient magnetic field. This mechanism is restricted only at a frequency which is slightly below the ion cyclotron frequency. The 2 mechanisms might find an application in (a) the heating of the thermonuclear plasma and (b) plasma propulsion. The mechanism likewise might enable us to explain some of the low frequency whistler type radio noise. Preliminary results on (a) the plasma waves in an inhomogeneous plasma and (b) the microscopic analysis of the drifting plasma. (Author)

AD-259 101 Div. 25, 7
(5 July 61) OTS price $1.60

Stanford Research Inst., Menlo Park, Calif.
THERMOELECTRIC MATERIALS.
Bimonthly progress rept. no. 13, 1 Dec 60-1 Feb 61,
by J. W. Johnson. 28 Feb 61, 10p. incl. illus. tables.
(Contract NObs-77017)
Unclassified report

DESCRIPTORS: *Thermoelectricity, *Copper compounds, *Intermetallic compounds, Sulfides, Tellurides, Electrical properties, Resistance, Measurement, Thermal conductivity, Liquids, Solids, Materials, Semiconductors, Electric power production.

Several compositions of the Cu2S-Cu2Te system were examined in both the liquid and solid states. Seebeck coefficient and resistivity measurements were made on samples containing 25, 50, and 75% Cu2Te. The Seebeck coefficient showed a peak at the solidification point in the 50-50 composition which corresponds to one observed in Cu2S. The 25 and 75% Cu2S compositions did not show this peak in the Seebeck coefficient. Resistivity of

all the compositions was characterized by a relatively constant value in the liquid and a decreased value as solidification began. This decrease was quite sharp in the 50-50 mixture in the region of 910-950 C. Adding Cu2Te to Cu2S resulted in lowering the resistivity and the Seebeck coefficient of the sulfide; however, some improvement was noted in the thermoelectric parameters. Data were obtained on the thermal conductivity of Cu2S up to 950 C by using the Peltier method. The thermal conductivity in the liquid state is to be determined by using the comparison method with fused quartz as the reference material.

AD-259 104 Div. 25, 7, 17
(27 June 61) OTS price $1.60

Chrysler Corp., Detroit, Mich.
RESEARCH PROGRAM ON SEMICONDUCTING COMPOUNDS FOR THERMOELECTRIC POWER GENERATION AT HIGH TEMPERATURES.
Bimonthly progress rept. no. 5, 15 Jan-14 Mar 61.
by C. R. Lewis, 14 Mar 61, 13p. incl. illus. table.
(Contract NObs-78664)
Unclassified report

DESCRIPTORS: *Semiconductors, *Thermoelectricity, High temperature research, Materials, Refractory materials, Metals, Intermetallic compounds, Measurement, Electrical properties, *Electric power production, Resistance, Thermal conductivity.

An investigation is being made of semiconducting combinations of the heavy refractory metals with high-atomic weight elements of groups 4B, 5B, and 6B of the periodic table, and of less metallic variations of the refractory superlattice intermetallic compounds as possible materials for high-temperature thermoelectric elements. The following compounds were studied: (1) arsenic compounds, (2) Hf-Bi, (3) Re-Te, (4) Hf-Se, (5) Re-Ge, (6) Hf-Sb, (7) Hf-Ge, (8) Hf-Te, and (9) W-Se-Te. Methods are being developed for gravimetric chemical analysis of the materials being prepared. Spectrographic analysis was made of most of the samples to indicate the level of impurities incidently added to the materials during processing. The apparatus for measurement of thermoelectric properties was rebuilt with an increase of nearly 200 degrees C in the maximum temperature which can be measured.

AD-259 105 Div. 25, 2
(5 July 61) OTS price $1.60

Tokyo U. (Japan).
STUDIES OF NIGHT AIRGLOW, RELATED MECHANISM AND OF ATMOSPHERIC ATOMS AND MOLECULES.
Final rept.,
by Haruo Ootuka, 20 Apr 61, 9p.
(Contract AF 62(531)1486)
(AFCRL-422)
Unclassified report

DESCRIPTORS: Astronomy, Atmosphere, *Light, *Optics, Aurorae, Atoms, Molecules, Infrared radiation, Spectrographic analysis, *Sky brightness, *Night sky.

Research is to include measurement of absolute intensity and intensity distribution of night airglow, experimental study on reaction mechanism of aurora, night and day airglows and of other atmospheric reactions in the upper atmosphere, and spectroscopic or photon counter study of atmospheric atoms and molecules by the spectroscopic and photon counter technique. Diurnal and semi-diurnal variation were found in the infrared emission of the night airglow. The absolute intensity of the infrared emission in the night airglow was determined. (Author)

AD-259 121 Div. 25, 14
(7 July 61) OTS price $2.60

Arizona State U., Tempe.
RESEARCH TO PRODUCE A TEMPERATURE STABLE MATERIAL WITH A HIGH THERMOELECTRIC FIGURE OF MERIT,
Quarterly progress rept. no. 6, 18 Feb-17 May 61 on Thermoelectric Materials and Device Research,
by B. Gossick, L. Stubbe, and others. 17 May 61, 24p. incl. illus. table.
(Contract DA 36-039-sc-85249)
Unclassified report

DESCRIPTORS: *Semiconductors, *Titanium compounds, Tungsten, Tantalum, Colloids, Dioxides, Thin film, Electrical properties, Thermoelectricity, High temperature research, Crystals, Solid state physics, Production, Preparation, Materials.

Samples of high density polycrystalline TiO2 were prepared. These samples, in the form of small slices with one polished face, were partially reduced and a film of TiO2 was deposited on the polished face. Colloidal W particles were made by reducing the size of W spheres electrolytically. These particles were mixed with precipitated TiO2 and consolidated into polycrystalline TiO2 by controlled dehydration. The temperature of ignition was high enough to cause complete oxidation of the metal, and the final samples were considered unsatisfactory. The electrical properties of rectifying barriers on rutile were treated. A substantial increase in reverse breakdown voltage was reported. (Author)

AD-259 156 Div. 25, 8
(5 July 61) OTS price $3.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
POLARIZATION OF CHARACTERISTIC WAVES IN A MAGNETO-IONIC MEDIUM.
by G. A. Deschamps. 15 Mar 61, 27p. incl. illus.
(Scientific rept. no. 3)
(Contract AF 19(604)5565)
(AFCRL-621)
Unclassified report

DESCRIPTORS: *Polarization, *Electromagnetic waves, Propagation, *Plasma physics, Magnetohydrodynamics, Wave transmission, Magnetic fields, Ionosphere, Transformations, Theory, Mathematical analysis.

The polarization of a plane wave propagating through a homogeneous magneto-ionic medium in a given direction can be obtained from Appleton-Hartree equations. It is shown that the point representing this polarization on the Poincare sphere described simple curves when the basic parameters are varied. If these curves are drawn on a map of the Poincare sphere a convenient method results for evaluating the characteristic polarizations for any conditions in the medium or conversely for deducing the properties of the medium from the observed polarizations. Special cases are discussed in terms of this representation. (Author)

AD-259 171 Div. 25, 9
(11 July 61) OTS price $4.60

Brown U. Div. of Applied Mathematics, Providence, R. I.
SURFACE WAVES IN DEFORMED ELASTIC MATERIALS,
by M. Hayes and R. S. Rivlin. May 61, 49p.
(Technical rept. 67; Rept. no. C11-67)
(Contract Nonr-56210, Proj. NR-064-406)
Unclassified report

# Division 25 - PHYSICS

DESCRIPTORS: *Solids, *Elasticity, Theory, Deformation, *Wave transmission, Motion, Equation, Mathematical analysis, Surfaces, Propagation, Stresses, Wave analysis.

The theory (Proc. Roy. Soc. A, 211:128, 1952) of the superposition of infinitesimal deformations on finite deformations in an isotropic elastic material is applied to the study of the propagation of surface waves in a semi-infinite body which is subjected to a static, pure homogeneous deformation. The possibility of having surface waves with transverse horizontal movement in a semi-infinite body, subjected to a pure homogeneous deformation, is discussed. We find that such waves may not be propagated in a principal direction unless stringent conditions are imposed on the strain-energy function. (Author)

AD-259 172 Div. 25
(11 July 61) OTS price $1.10

Brown U. Div. of Applied Mathematics, Providence, R. I.
A NOTE ON THE SECULAR EQUATION FOR RAYLEIGH WAVES, by M. Hayes and R. S. Rivlin. June 61, 6p. (Technical rept. no. 68; Rept. no. C11-68)
(Contract Nonr-56210, Proj. NR-064-406)
Unclassified report

DESCRIPTORS: Wave analysis, *Elasticity, Theory, Solid state physics, Mathematical analysis.

The secular equation for Rayleigh surface waves in classical elasticity theory is examined in detail. It is shown, in particular, that when the equation has complex roots the associated displacement components are inadmissable - they do not satisfy the condition that they tend to zero at infinity. Rayleigh demonstrated this result numerically for an incompressible body. (Author)

AD-259 175 Div. 25, 15
(10 July 61) OTS price $2.60

Brown U. Div. of Applied Mathematics, Providence, R. I.
ON THE MOTION OF A CHARGED PARTICLE IN A TIME-DEPENDENT MAGNETIC FIELD,
by E. T. Y. Lee and W. H. Reid. June 61, 19p. incl. illus. tables (Scientific rept. no. 6)
(Contract AF 19(604)7236)
(AFCRL-636) Unclassified report

DESCRIPTORS: *Particles, *Magnetic fields, Motion, Differential equations, Mathematical analysis, Magnetohydrodynamics, *Dipole moments.

The motion of a charged particle in a homogeneous magnetic field which varies linearly with time is investigated. An exact expression for the variation of the magnetic moment is obtained and is compared with the approximate results of Hertweck and Schluter. It is found that both analyses give the same asymptotic behavior of the moment for slow changes of the field, at least up to the second-order in the rate of change of the field. (Author)

AD-259 193 Div. 25, 6
(10 July 61) OTS price $2.60

Cambridge Acoustical Associates, Inc., Mass.
THE EFFECT OF SURFACE REFLECTIONS ON DIRECTIVE SOUND SOURCES,
by W. Thompson, Jr. and M. C. Junger. 6 June 61, 27p. incl. illus. (Rept. no. U-117-48)
(Contract Nonr-273900)
Unclassified report

DESCRIPTORS: *Sound transmission, *Underwater sound transmission, *Wave transmission, Interference, Sonar signals, Sonar projectors, Underwater sound, Acoustics, Sound, *Wave analysis, Reflection.

Reflections from the sea surface affect the acoustic power radiated by sound sources located at shallow depths. Furthermore, these surface reflections produced propagation anomalies characterized by a pattern of interference fringes and, at larger range, by abnormally high spreading losses known as the acoustic Lloyd mirror effect. Both phenomena are well-known for simple, non-directional sources. They are studied here for directive sources whose directivity patterns have a horizontal or tilted main lobe. Directive sources differ from simple sources in that the surface-reflected and direct rays are of different intensity. This causes a marked blurring of the interference fringe pattern, but has a negligible effect on the propagation anomaly at the long ranges where the Lloyd mirror effect holds. This is illustrated quantitatively for a horizontal end-fire directive array. The effect on power output of phase cancellations and reinforcements by surface-reflected sound waves is generally less marked than for a simple source. This is illustrated quantitatively for a vertical linear array of elements vibrating in phase. The Appendix presents the effect of rigid and pressure release reflectors on the directivity patterns and power outputs of variously oriented multipole sources. (Author)

AD-259 247 Div. 25
(11 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ELECTRIC CURRENT JET FLAME GENERATOR (Plamenno-struynyy Generator Elektricheskogo Toka).
by A. I. Moskvitin. 3 May 61, 2p. (Trans. no. MCL-914 of Byulleten' Izobretemiy 37:31-32, Nov 60).
Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, *Plasma physics, USSR, Technological intelligence, Electric currents, Jet flames, Gas ionization.

An electric current jet flame generator is briefly described, and several modifications to the basic design are mentioned.

AD-259 254 Div. 25, 9
(11 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
DISTRIBUTION OF TEMPERATURES IN A CYLINDER WITH

INTERNAL HEAT SOURCES AND COOLING BY A TURBULENT LIQUID FLOW,
by T. L. Perelman. 26 Apr 61, 4p. (Trans. no. MCL-869 of Inzhenuno-Fizicheskiy Zhurnal:pp. 72-76, Nov 60)
Unclassified report

DESCRIPTORS: Cylindrical bodies, *Heat transfer, Heat exchangers, Cooling, *Fluid flow, Fluid mechanics, Mathematical analysis, Partial differential equations, Liquid cooled, USSR, *Turbulent flow, Distribution.

AD-259 256 Div. 25, 15
(11 July 61) (OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
PROBLEM OF HEAT AND MOISTURE TRANSFER FOR A SEMILIMITED MEDIUM OF THREE MEASUREMENTS FOR BOUNDARY CONDITIONS OF THE SECOND MAGNITUDE,
by P. V. Tsoy. 27 Mar 61, 10p. (Trans. no. MCL-865 of Inzhenerno-Fizicheskiy Zhurnal 3:112-119, June 60)
Unclassified report

DESCRIPTORS: *Heat transfer, *Moisture, Mathematical analysis, Partial differential equations, USSR.

AD-259 282 Div. 25
(14 July 61) OTS price $7.60

California U., Los Angeles.
STRESS FIELD IN POLYCRYSTALLINE METALS AT INITIAL STAGE OF PLASTIC DEFORMATION.
Final rept.
by T. H. Lin, S. Uchiyama and others. Jan 61, 68p. incl. illus. 18 refs. (Rept. no. 61-6)
(Contract AF 49(638)20)
(AFOSR-530) Unclassified report

DESCRIPTORS: *Metals, *Crystals, *Metallic crystals, *Deformation, Stresses, Crystal structure, Single crystals, Plasticity, Elasticity, Aluminum, Theory, Mathematical analysis, Lattices, Shear stresses.

The stress fields caused by the following cases are analytically computed: (1) uniform slip in a cubical crystal at the interior of the aggregate; (2) non-uniform slip in a cubical crystal in the interior; (3) non-uniform slip in two closeby crystals in the interior, and (4) uniform slip in a crystal at the surface of the aggregate. In cases (1) and (4), the critical shear stress in the sliding crystal is uniform but the resolved shear stress is not. These 2 cases computed give stress fields caused by inclusions uniformly transformed in shape and give approximate stress fields for sliding work-hardening crystals in an aggregate. In cases (2) and (3), the resolved shear stresses in the slipped region equal to its critical shear stresses and these 2 cases give the stress fields caused by sliding work-hardening crystals in the aggregate. (Author)

AD-259 315 Div. 25, 20
(11 July 61) OTS price $1.60

Maryland U., College Park.
A NOTE ON REARRANGEMENT COLLISIONS,
by T. B. Day, L. S. Rodberg and others. 22 Mar 61, 9p. (Technical rept. no. 208)
(Contract AF 49(638)24)
(AFOSR-771) Unclassified report

DESCRIPTORS: *Quantum mechanics, Particles, Scattering, *Nuclear reactions, Nuclear physics, Mathematical analysis.

The conventional Born approximation formula for rearrangement collisions is used extensively in both atomic and nuclear physics. This formula contains a direct contribution from the heavy particle or core interaction. A straightforward demonstration shows that for the usual case of a massive core this contribution does not appear, so that the only effect of this interaction is to distort the incident and outgoing waves. Such problems as the post-prior discrepancy are clarified. (Author)

AD-259 316 Div. 25, 15
(11 July 61) OTS price $1.60

Maryland U., College Park.
TWO-POINT FUNCTION AND GENERALIZED FREE FIELDS,
by A. L. Licht and J. S. Toll. 8 Apr 61, 9p. (Technical rept. no. 210)
(Contract AF 49(638)24)
(AFOSR-772) Unclassified report

DESCRIPTORS: Functional analysis, *Operators (Mathematics), *Quantum mechanics, Functions, Measure theory, *Nuclear physics.

Several theorems are proven which relate to the possibility of constructing a noninteracting field with an arbitrary two-point Wightman function. They are: (a) if phi (x) is a complete local field, and phi (x), phi (y) = D(x-y), where D is an arbitrary operator depending on x and y only through their difference, then D is a c-number function; (b) such fields are generalized free fields, as defined by Greenberg; (c) any generalized free field is unitarily equivalent to a superposition of Klein Gordon fields, and moreover the asymptotic condition and unitarity restrict this to a superposition of ordinary free fields with different discrete masses. (Author)

AD-259 341 Div. 25, 15
(11 July 61) OTS price $1.60

Institute of Mathematical Sciences, New York U., N. Y.
A CONVERGENT FARFIELD EXPANSION FOR TWO-DI MEN-
SIONAL RADIATION FUNCTIONS,
by S. N. Karp. Apr 61, 12p. (Research rept. no. EM-169)
(Contract AF 19(604)5238)
(AFCRL-173) Unclassified report

DESCRIPTORS: *Electromagnetic theory, Wave analysis, Differential equations, Functions, Special functions, *Series, Polynomials, Taylor's series, Electromagnetic fields, Electromagnetic waves.

AD-259 342 Div. 25
(11 July 61) OTS price $7.60

Institute of Mathematical Sciences, New York U., N. Y.
REFLECTION AND REFRACTION OF WEAK HYDROMAGNETIC DISCONTINUITIES,
by Jack Bazer. Feb 61, 69p. incl. illus. (Research rept. no. MH-11)
(Contract AF 19(604)6144)
(AFCRL-268) Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, Wave analysis, Wave characteristics, Magnetic fields, Electromagnetic wave reflections, Refraction, *Electromagnetic waves, Mathematical analysis.

The problem of reflection and refraction of weak hydromagnetic disturbances at surfaces of discontinuity in the medium is studied. It is shown that the introduction of an appropriate set of direction angles for the unperturbed magnetic field on each side of the discontinuity makes possible (1) a simplification of V. C. A. Ferraro's laws relating to the reflection and refraction of Alfven waves and (2) a simple graphical method for determining the real angles and speeds at which the reflected and refracted waves emerge. The relationship of the graphical procedure to Huyghens' construction is discussed. Application of the theory is made to several two-dimensional steady-flow problems and to the problems of reflection and refraction at a rigid infinite conductor and at a contact discontinuity. (Author)

AD-259 354 Div. 25, 26, 8
(11 July 61) OTS price $1.60

Polytechnic Inst. of Brooklyn, N. Y.
THIN FILMS OF FERRIMAGNETIC OXIDES.
Progress rept. no. 11, 1 Jan-31 Mar 61.
31 Mar 61, 7p. incl. table.
(Contract DA 36-039-sc-78107, Proj. 3-99-06-108)
Unclassified report

DESCRIPTORS: *Ferromagnetic materials, *Ferrites, *Thin films, *Garnet, Iron compounds, Yttrium compounds, Oxides, Nickel compounds, Manganese compounds, Powder metals, Spinel, Magnetic properties, Microwave frequency, Measurement, Phase studies, Production, *Metal films, Chemical analysis, High temperature research, Vapor plating, Evaporation.

Additional measurements at microwave frequencies of a number of ferrimagnetic oxide films are reported and analyzed. Continuing work on evaporation procedure is mentioned along with preliminary findings concerning a procedure for the wet chemical analysis of oxide films containing iron cations. (Author)

AD-259 355 Div. 25
(11 July 61) OTS price $1.60

Polytechnic Inst. of Brooklyn, N. Y.
CREEP BENDING OF COMPRESSIBLE PLATES,
by Sharad A. Patel and B. Venkatraman. Apr 61, 17p. incl. illus. (PIBAL rept. no. 590)
(Contract AF 49(638)302, Proj. 9782)
(AFOSR-848) Unclassified report

DESCRIPTORS: *Creep, *Sheets, Deflection, Moments, Mathematical analysis, Theory, Structures, Equations, Stresses, Deformation, Solid state physics, Mechanics, Metal plates.

A nonlinear moment-curvature relation is developed for the creep-bending analysis of thin-plates made of compressible materials. This relation is used to analyse two specific annular plates: An annular plate simply supported along the outer edge and free at the inner edge, with uniform radial moments applied along the supported circumference; an annular plate clamped along the inner edge and free at the outer edge, with uniform radial moments applied along the free circumference. Solutions for moment distributions and deflections are presented for both problems. (Author)

AD-259 356 Div. 25
(11 July 61) OTS price $9.10

Polytechnic Inst. of Brooklyn, N. Y.
NUMERICAL STRESS ANALYSIS OF CIRCULAR CYLINDRICAL SHELLS. PART III. A VARIATIONAL SOLUTION OF THE INTERSECTION PROBLEM,
by Tyn Myint, J. R. M. Radok, and Marie Wolfson. May 61, 102p. incl. illus. tables, 10 refs.
(PIBAL rept. no. 592)
(Contract Nonr-83926, Proj. NR 064-437)
Unclassified report

DESCRIPTORS: *Cylindrical bodies, *Structural shells, Stresses, Mathematical analysis, Numerical analysis, Computers, Tables.

Approximate solutions of an intersection problem for circular cylindrical shells are obtained. The applicability of the method developed for this purpose extends beyond the specific application presented. It is based on the application of the Ritz method to the potential energy stored in the boundary region of the deformed shell. Use of Lagrange multipliers has helped to greatly simplify the algebra. Listings of IBM 704 programs for every stage of the procedure are presented together with input and output information. Numerical results are presented in the form of tables of integrals which permit the application of the method to a wide range of problems. A simple application serves to illustrate the method and to justify its analytical basis. Suggestions for further investigations include a parametric study of different cylinder ratios, boundary conditions and shell theories. (Author)

AD-259 373 Div. 25
(10 July 61) OTS price $8.60

Stanford U., Calif.
DEFORMATION OF HEATED SHELLS,
by W. S. Hemp. Apr 61, 94p. incl. illus. (Rept. no. SUDAER 103)
(Contract AF 49(638)223, Proj. 9782)
(AFOSR-770) Unclassified report

DESCRIPTORS: *Structural shells, Sheets, Cylindrical bodies, Spheres, *Deformation, Mathematical analysis, Thermal stresses, Stresses, Theory.

Methods were investigated for the analysis of deformation and stresses induced by heating of thin shells. The general theory of thin shells is reviewed. The shell is defined in terms of its middle surface and thickness and its properties, both before and after deformation, are defined by metric and curvature tensors which satisfy the Gauss and Codazzi equations of surfaces. The state of strain is defined in terms of these quantities and equations are derived for membrane strains and curvature changes. This kinetic basis may be combined with either the principle of stationary free energy or with the equilibrium equations to form a complete theory of shells. Extensional solutions which are found to be stress-free are first investigated and then departures from these solutions are considered. The special problem of buckling induced by compressive stresses in an edge effect is investigated, and an energy method of solution is given.

AD-259 374 Div. 25
(10 July 61) OTS price $3.60

Stanford U., Calif.
DAMPING OF THE VIBRATIONS OF A COILED SPRING DUE TO CREEP,
by N. J. Hoff. June 60, 32p. incl. illus. tables.
(Rept. no. SUDAER 96)
(Contract AF 49(638)223)
(AFOSR-833) Unclassified report

DESCRIPTORS: *Springs, Vibration, *Damping, *Creep, Elasticity, Mechanics, Deformation, Attenuation, Viscosity, Mathematical analysis, Differential equations, Helical springs.

The vibrations of a concentrated mass suspended from a coiled spring are studied when the material of the spring is capable of deforming both elastically and in consequence of creep. When the creep law is linear, the attenuation of the vibrations is independent of the amplitude. When the creep law is non-linear in the sense that the creep rate is a power function of the force transmitted by the spring, with the exponent greater than unity, the attenuation increases with increasing amplitude. (Author)

AD-259 375 Div. 25, 17, 30
(10 July 61) OTS price $3.60

Stanford U., Calif.
CREEP EXPERIMENTS WITH STEPWISE CHANGES OF THE TENSILE LOAD (DATA ON 5052 Al. ALLOY AT 450 F),
by J. F. Besseling and D. W. Dutton. Aug 60, 28p. incl. illus. (Rept. no. SUDAER 95)
(Contract AF 49(638)223, Proj. 9782)
(AFOSR TN 60-1330) Unclassified report

DESCRIPTORS: *Creep, Test equipment, Strain gages, Stresses, Deformation, Measurement, Temperature, Aluminum alloys, Sheets, Mechanics, Tests.

A description is given of equipment developed for creep tests carried out in a screw-type tensile testing machine with electrical drive. The load is held constant within 5 lb by a sensitive on-off control of the electrical drive of the testing machine, and stepwise load changes can be realized by an adjustable strain-gauge bridge. The on-off control of the oven, which is designed for temperatures up to 900 F, keeps the temperature of the gauge length of the specimen constant within 1 F. Temperature measurements are taken by means of thermocouples welded to the specimen. Strain measurements under stable temperature conditions are obtained with the aid of an extensometer equipped with differential transformers. Elongation and temperature of the specimen are recorded continuously or at regular intervals, with an accuracy of 1/10,000 in. and 1 F, respectively. The report includes creep data for stepwise load changes for Al alloy 5052 at 450 F. (Author)

AD-259 383 Div. 25
(10 July 61) OTS price $7.60

Washington U., St. Louis, Mo.
POSITRON LIFETIMES AGAINST ANNIHILATION IN METALS AND ALKALI HALIDES.
Doctoral thesis.
by Betty Lou Dilmore Pollak. Mar 61, 72p. incl. illus. tables (Technical rept. no. 43)
(Contract AF 18(603)108)
Unclassified report

DESCRIPTORS: *Positrons, Electrons, *Radioactive mean life, Radioactive decay, Solid state physics, *Annihilation reactions, Copper, Silver, Magnesium, Crystals, Nuclear models, Halogen compounds, Lithium, Sodium, Potassium, Cesium.

The positron lifetimes against annihilation in three metals (Cu, Ag, Mg) and ten alkali halide crystals (LiF, NaF, NaCl, NaBr, NaI, KCl, KBr, KI, CsBr, CsI) was determined. The lifetimes obtained are in qualitative agreement with the simple theory discussed in Chapter III. Chapter II serves as a general introduction to the use of the phenomenon of positron-electron annihilation as a tool to explore the electronic structure of solids. Chapter III summarizes the work (experimental and theoretical) which is pertinent to the subject of this thesis. Chapter IV describes the experimental technique and the equipment. Analysis of the data is also treated in this section. A summary of the results of this experiment is given in Capter V. Chapter VI consists of a discussion of the data and comparison with other data as well as the rough theory described in Chapter III for the alkali halides. This section also contains suggestions for further work on the alkali halides. (Author)

AD-259 410 Div. 25, 26, 6
(13 July 61) OTS price $1.60

Airtron, Inc., Morris Plains, N. J.
THE PREPARATION OF SINGLE CRYSTAL FERRITE MATERIALS BY THE FLOATING ZONE TECHNIQUE,
Quarterly progress rept. no. 13, 25 Jan-25 Apr 61, by Donald A. Tepore, 20 June 61, 10p. incl. illus.
(Rept. no. R11-354)
(Contract NOrd-18020)
Unclassified report

DESCRIPTORS: *Ferrites, *Single crystals, Metallic crystals, Crystals, *Ferromagnetic materials, Nickel compounds, Iron compounds, Yttrium compounds, *Garnet, Growth, Melting, Zone melting, Heat treatment, Manufacturing methods, Electrical properties, Magnetic properties, Radar equipment, X-band, C-band, Magnetic materials, Materials.

A small crystal of Yt Fe garnet was pulled from a self-contained melt at atmospheric pressure. However, line width and resistivity measurements indicated that the crystal was extremely O deficient. Also, observation and results from several other pulling experiments are presented. Oxygen heat treatment of Fe rich Ni ferrite single crystals at 1000 C for one month did not increase the resistivity above that which was reported for a 70 hr treatment. (Author)

AD-259 445 Div. 25
(12 July 61) OTS price $5.60

Diamond Ordnance Fuze Labs., Washington, D. C.
SHAPE OF THE CURRENT OUTPUT PULSE FROM A THIN FERROELECTRIC CYLINDER UNDER SHOCK COMPRESSION,
by R. H. Wittekindt. 15 May 61, 55p. incl. illus.
(DOFL rept. no. TR-922)
(Proj. 30300)
Unclassified report

DESCRIPTORS: *Ferroelectricity, Mathematical analysis, Integral equations, Differential equations, Polarization, Shock, Transducers, Dielectrics, Conductivity, Shock waves, Theory, Hysteresis.

When a polarized ferroelectric element is traversed by a shock front that destroys the polarization, a current output appears. The shape of the curve of this current output versus time is computed in a normalized and general form for the case where the shock front moves in a direction normal (or approximately normal) to the electrodes and parallel to the polarization. The influence of the external electric load, of the dielectric constants and the hysteresis, of a conductivity in the compressed material, and of an oblique impact is discussed. The condition for maximum energy output also is discussed. Mathematical expressions for the current output are given for the various conditions, examples are calculated and shown in graphs. Methods are described for evaluating the dielectric constant in the compressed material from measured output curves. (Author)

AD-259 452 Div. 25, 27, 9
(14 July 61) OTS price $8.10

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
INVESTIGATION OF THE ATTENUATION OF SHOCK WAVES PROPAGATED THROUGH AN IONIZED GAS IN THE PRESENCE OF A TRANSVERSE MAGNETIC FIELD,
by S. P. Carfagno and G. P. Wachtell. June 61, 80p. incl. illus. tables, 22 refs. (Proj. Squid Technical rept. no. FIL-1-R)
(In cooperation with James Forrestal Research Center, Contract Nonr-185825)
Unclassified report

DESCRIPTORS: *Jet propulsion, Attenuation, *Shock waves, *Magnetohydrodynamics, Magnetic fields, Gas flow, Plasma physics, Ionization, Shock tubes, Test equipment, Tests, Photomultipliers, Statistical analysis, Power supplies, Boundary layer, Theory, *Gases, Measurement.

Measurements were made of the attenuation of shock waves propagated through an ionized gas in the presence of a transverse magnetic field. Ionization was produced by maintaining a radio frequency discharge in the low pressure section of a shock tube. The electrical gas conductivity achieved by this means was less than 1 mho/m, a value much smaller than was anticipated. Largely because of the low conductivity, negligible shock wave attenuations were predicted by the pertinent theory of magnetohydrodynamics (MHD). Nonetheless, appreciable shock wave attenuations were observed. Measurements made with several experimental arrangements and statistical analysis of the data demonstrate an MHD effect. A satisfactory explanation for the apparent discrepancy between theory and experiment was not attained, although some plausible speculations were made. A discussion is presented of MHD theory and the theory of a simple shock tube in addition to a detailed discussion of the experimental measurements and an analysis of the data. (Author)

AD-259 469 Div. 25
(13 July 61) OTS price $5.60

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
THE VAPORIZATION OF GRAPHITE, TiC, ZrC AND HfC,
by Guido L. Vidale. June 61, 47p. incl. tables.
(TIS Rept. no. R61SD010)
(Contract AF 33(616)6841)
Unclassified report

DESCRIPTORS: *Vapor pressure, *High temperature research, *Carbides, Titanium, Hafnium, Zirconium, Molecules, Thermodynamics, Tables, Graphite.

The vapor pressure over graphite, TiC, ZrC and HfC is estimated from thermodynamic data available in the literature. It is shown that the accuracy of the calculated pressure is limited by uncertainties in several key thermodynamic properties. The available data are extrapolated to high temperatures, and the magnitude of the error so introduced is discussed. (Author)

AD-259 477 Div. 25
(14 July 61) OTS price $3.60

IBM Command Control Center, Federal Systems Div., Kingston, N. Y.
VAPOR PHASE GROWTH OF SILICON.
Quarterly progress rept. no. 3, 1 Feb-30 Apr 61, by H. J. Beatty, R. Glang, and J. G. Kren. 30 Apr 61, 31p. incl. illus. tables (Rept. no. 7)
(Contract DA 36-039-sc-87395; Continuation of Contract DA 36-039-sc-84547)
Unclassified report

DESCRIPTORS: *Silicon, Single crystals, Growth, Deposits, *Semiconductors, *Transistors, Silanes, Reduction, Hydrogen, Silicon compounds, Chlorides, Thin films, Crystal structure, Lattices, Deformation, Impurities.

Two different systems were developed to investigate the deposition of single crystalline Si through the H reduction of trichlorosilane. With these systems, numerous deposition experiments were made in an attempt to establish the optimum operating conditions. The quality and properties of vapor grown Si films have been found to depend on many process parameters in a complex pattern. Some of these parameters have been studied individually, and their influence on the grown Si film has been identified. The investigation is not yet complete enough to offer a fully controlled process. More and systematic experiments are required to allow controlled doping, and additional attention has to be given to the problem of crystal perfection. (Author)

AD-259 490 Div. 25, 7
(14 July 61) OTS price $9.10

Massachusetts Inst. of Tech., Cambridge.
BOUNDARY LAYER EFFECTS IN MAGNETOHYDRODYNAMIC FLOWS,
by W. Craig Moffatt. June 61, 52p. incl. illus. 30 refs. (Proj. Squid Technical rept. no. MIT-26-P)
(In cooperation with James Forrestal Research Center, Contract Nonr-185825, Proj. NR-098-038)
Unclassified report

DESCRIPTORS: *Boundary layer, *Magnetohydrodynamics, Heat transfer, Electrical properties, Thermodynamics, Conductors, Conductivity, *Electric fields, Electrical conductance, Electric power production.

The growth is analyzed of magnetohydrodynamic boundary layers, and the magnitude of the attendant electrical losses and heat transfer rates which might be expected in actual low-temperature MHD devices. The analysis, using integral methods, is made for constant velocity flow of an

incompressible fluid over a flat plate in the presence of a uniform magnetic field normal both to the flow and the plate. Two different physical models are assumed; a hot wall case in which the electrical conductivity is supposed constant throughout the flow, and a cold wall case in which the conductivity is taken to be zero below a given temperature and constant but finite above that temperature. For each of these cases viscous and thermal thicknesses are found for both laminar and turbulent boundary layers, and the resulting losses are presented in graphical form. (Author)

AD-259 491 Div. 25, 9, 10
(14 July 61) OTS price $2.60

Massachusetts Inst. of Tech., Cambridge.
THE THERMODYNAMIC AND ELECTRICAL PROPERTIES OF DISSOCIATED COMBUSTION GASES,
by W. Craig Moffatt. June 61, 23p. incl. illus. table (Proj. Squid Technical rept. no. MIT-27-P)
(In cooperation with James Forrestal Research Center, Contract Nonr-185825, Proj. NR-098-038)
Unclassified report

DESCRIPTORS: *Thermodynamics, *Electrical properties, *Combustion chamber gases, Gas ionization, Ionization potentials, Temperature, Pressure, Gas flow, Digital computers, Programming.

Results of a program are described for use on the IBM 709 Computer to calculate the thermodynamic properties of a mixture of dissociating combustion gases. This program computes the equilibrium properties (enthalpy, entropy, molecular weight) of any system involving arbitrary amounts of carbon, oxygen, hydrogen, nitrogen and an inert gas over a wide range of temperatures and pressures. Included are the results, in the form of Mollier charts, for ten typical compositions. The electrical conductivity for such a mixture was calculated for 1, 3, and 10 potassium additive over a wide range of temperatures and pressures, and the results are presented in graphical form. For all the calculations, the presence of solids, negative ion formation, and chemical reaction of the seed material with the combustion gases were neglected. Since constant values of the collision cross sections were used, lines of electrical conductivity could be superimposed directly on the Mollier charts, an example of which is included. (Author)

AD-259 499 Div. 25, 15
(14 July 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
RADIAL FLUX OR FIELD OF AN ISOTROPIC, CYLINDRICAL SOURCE OF FINITE EXTENT,
by Edmund E. Callaghan and Lawrence Flax. July 61, 27p. incl. illus. (Technical note no. D-873)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-873.

DESCRIPTORS: *Electric fields, *Particles, *Diffusion, Intensity, Neutrons, Sources, Cylindrical bodies, Integrals, Mathematical analysis, Field emission.

The radial electric field intensity or the radial particle flux at any point outside a cylindrical, isotropic source of finite extent is derived. Expressions for the flux are obtained in terms of complete elliptic integrals. Results are presented in graphical form for a wide range of source lengths. (Author)

AD-259 531 Div. 25
(13 July 61) OTS price $1.60

Pennsylvania State U., University Park.
TRANSIENT THERMAL STRESSES IN A THIN DISK,
by Walter Jaunzemis, May 61, 16p. (Technical rept. no. 1)
(Contract AF 49(638)705)
(AFOSR TN 60-1166) Unclassified report

DESCRIPTORS: *Disks, *Thermal stresses, Transients, Elasticity, Theory, Mathematical analysis, Series, Thermal conductivity, Thermal diffusion, Thermal expansion, Bessel functions.

The investigation is concerned with the effects of inertia and thermodynamic coupling upon thermal stresses produced in a thin disk. Rotational symmetry is assumed, and the problem is treated within the two-dimensional theory of elasticity. A solution is obtained in the form of an infinite series, and comparison is made with solutions in which effects of inertia or thermodynamic coupling are neglected. For the problem considered, the effects of inertia and thermodynamic coupling are found to be negligible. (Author)

AD-259 532 Div. 25
(13 July 61) OTS price $2.60

Pennsylvania State U., University Park.
THERMAL STRESSES PRODUCED IN A DISK BY A ROTATING HEAT SOURCE,
by George T. Vavouras and Walter Jaunzemis. May 61, 23p. incl. illus. (Technical rept. no. 2)
(Contract AF 49(638)705)
(AFOSR TN 60-1167) Unclassified report

DESCRIPTORS: *Disks, *Thermal stresses, Mathematical analysis, Theory, Elasticity, Transients, Series, Bessel functions, Temperature, Thermal conductivity, Heating.

A study was made of thermal stresses generated in a disk by a rotating heat source. The problem is treated within two-dimensional elasticity theory, and inertia effects as well as thermodynamic coupling are neglected. The solutions for the stresses and the temperature are obtained in the form of infinite series of elementary and Bessel functions. Relative to a coordinate system rotating together with the heat source, the solutions for the stresses and temperature separate into transient and non-transient parts, the decay of the transient solutions being relatively slow. Numerical results are presented, and the behavior of stresses and temperature is studied in some detail, particularly for points near the edge of the disk. (Author)

AD-259 572 Div. 25, 9
(14 July 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
APPROXIMATION METHOD OF CALCULATING THE EFFECT OF DIFFUSION UPON THE HEAT CONDUCTION OF GASES IN A BOUNDARY LAYER,
by R. Z. Alimov. 3 May 61, 11p. incl. illus. (Trans. no. MCL-886 of Izvestiya Vysshikh Uchebnykh Zadeniy - Fizika 3:97-102, May-June 60)
Unclassified report

DESCRIPTORS: *Thermal conductivity, Gases, *Boundary layer, Diffusion, Mathematical analysis, Kinetic theory, Vapors, *Thermal diffusion, Heat transfer, Technological intelligence, USSR.

The effect of the diffusion of vapors of an adiabatic vaporable liquid is considered, with respect to the heat exchange between it and surrounding hot gas on the basis of the molecular and kinetic concept of the device of heat conduction. By means of simplified calculations which bear a preferably qualitative character, it is shown that the diffusion flow of a vaporable substance - possessing a direction opposed to heat flow - contributes to a decrease in heat exchange intensity in consequence of a decrease in the heat conduction coefficient of the boundary layer. (Author)

AD-259 578 Div. 25
(14 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
AIRBORNE ATOMIC CHRONOMETERS.
2 June 61, 5p. incl. illus. (Trans. no. MCL-867 of Tudomany Es Technika 16:p. 492, 1960)
Unclassified report

DESCRIPTORS: Airborne, *Chronographs, Instrumentation, Atomic energy engineering, Cesium, *Time, Frequency, Standards.

Contents:
Flying atomic clocks
Remote control of sugar refinery
Aquarium in the Red Sea
Plastic lining for irrigation channels
Safety device for high speed airplanes

AD-259 579 Div. 25, 17
(14 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
APPLICATION OF THE THEORY OF THERMODYNAMIC SIMILARITY TO DETERMINE THE PHYSICAL PROPERTIES OF HOT METAL (MOLTEN METALS) (Primeneniye Teorii Termodinamicheskogo Podobiya Dlya Opredeleniya Fizicheskikh Svoystv Zhidkikh Metallov),
by G. F. Butenko and M. I. Radchenko. 27 Mar 61, 9p. incl. illus. table (Trans. no. MCL-864 of Inzhenerno-Fozicheskiy Zhurnal 3:66-71, June 60)
Unclassified report

DESCRIPTORS: *Liquid metals, *Thermodynamics, Physical properties, Viscosity, Heat transfer, Thermal conductivity, Electrical conductance, Specific heat, USSR, Metals, Melting.

The relationship between dimensionless viscosity and the dimensionless Lorentz function for molten metals, pertaining to one group of thermodynamic similarity is discussed. A comparison was made of results obtained in calculating the viscosity for a number of metals with experimental values. An example of calculating heat conduction is given. The revealance of groups of thermodynamically similar substances offers the possibility, without the aid of an experiment, to determine the physical properties of one of the substances singularly by similar characteristics under analogous conditions. (Author)

AD-259 580 Div. 25
(14 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
HEAT LOSSES DURING THE DELIVERY OF LIQUIDS WITH THE AID OF HOT GASES (Teplovye Poteri Pri Nagnetanii Zhidkosti Goryachimi Gazami),
by N. Ye Kvantaliani. 27 Mar 61, 5p. incl. illus. (Trans. no. MCL-863 of Inzhenerno-Fizicheskiy Zhurnal 3:52-54, June 60)
Unclassified report

DESCRIPTORS: *Thermal conductivity, *Gases, *Liquids, Determination, Equations, USSR, Heat, *Heat transfer, Gas generating systems, Gas flow.

A discussion is presented of the heat loss involved when a liquid in a tank is forcibly blown into the surrounding medium through a valve under the pressure of a gas flowing through a pipe from a gas generator. The process of continuous uniform outflow of liquid within a period at constant pressures in the tank and in the surrounding medium is discussed.

AD-259 581 Div. 25
(14 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
TEMPERATURE FIELD IN A FINITE CYLINDER WITH INTERNAL SOURCES,
by T. L. Perel'man. 27 Mar 61, 7p. (Trans. no. MCL-862 of Inzhenerno-Fizicheskiy Zhurnal 3:138-144)
Unclassified report

DESCRIPTORS: *Cylindrical bodies, *Heat transfer, Mathematical analysis, Differential equations, Transformations (Mathematics), Thermal conductivity, *Thermodynamics, Thermal diffusion, USSR, Theory.

AD-259 587 Div. 25, 4
(14 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THERMAL EXPLOSION OF DINITROXYDIETHYLNITRAMINE UNDER PURELY CONVECTIVE HEAT TRANSFER CONDITIONS (Teplovoy Vzryv Dinitroksidietilnitramina V Usloviyakh Chisto Konvektivnoy Teploperedachi),
by F. I. Dubovitskiy, V. V. Barzykin, and A. G. Merzhanov. 20 Mar 61, 6p. incl. illus. table (Trans. no. MCL-846 of Izvestiya Akademii Nauk, SSSR, Otdeleniye Khimicheskikh Nauk, 6:1124-1126, June 60)
Unclassified report

DESCRIPTORS: *Explosions, *Heat transfer, Reaction kinetics, Nitro radicals, *Amines, Ethyl radicals, *Explosives, Liquids, Test methods, Melting, Test facilities, Theory, USSR, Temperature, Thermochemistry, Heating.

A method was developed for studying thermal explosion of liquid and melted explosives at purely convective heat transfer. The critical conditions of thermal explosion of dine (dinitroxydiethylnitramine) were investigated. Good conformity was shown between the experimentally determined temperature values and heatings with the ones calculated by the Semenov theory. (Author)

AD-259 595 Div. 25
(14 July 61) OTS price $4.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
TRANSACTIONS OF THE MOSCOW AVIATION INSTITUTE OF

TECHNOLOGY; PROBLEMS OF THE RESISTANCE OF MATERIALS (SELECTED ARTICLES).
20 Mar 61, 41p. incl. tables (Trans. no. MCL-611 of Trudy: Moscow Aviatsionnyy Tekhnologicheskiy Institut. Voprosy Soprotivleniya Materialov, 37, Moskva:5-12 and 13-32, 1959)
Unclassified report

DESCRIPTORS: *Disks, *Bodies of revolution, Load distribution, Pipes, Pipe bends, *Deformation, Stresses, Plasticity, Buckling, Mathematical analysis, Theory.

Contents:
On the influence of the design and material of a rotating disk on its stressed state and load-carrying capacity, by Yeugen Peshina
Concerning the approximation of deformation diagrams, by G. T. Ivanov and I. A. Skoryy

AD-259 606 Div. 25, 9
(17 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
HEAT EXCHANGE DURING THE FLOW OF LIQUID METAL IN THE LAMINAR AND TRANSITION REGIONS,
by B. S. Petukhov and A. Ya. Yushin. 26 May 61, 9p. incl. illus. (Trans. no. MCL-993 of Doklady Akademii Nauk SSSR 136:pp. 1321, 1961)
Unclassified report

DESCRIPTORS: *Liquid metals, *Thermal conductivity, *Fluid flow, Laminar boundary layer, *Heat transfer, Mercury, Measurement, USSR, Steel tubing.

An experimental investigation was conducted of the heat transfer occurring during forced flow of Hg in a circular pipe in the laminar and transition regions with constant density of the heat flux on the wall. The heat transfer was studied under conditions of hydrodynamic and thermal stabilization of the flux. The following conclusions were drawn: (1) due to the presence of grooves in the working sections of the apparatus a pronounced unevenness occurred in the distribution of the density of the heat flux per unit length of the pipe over the length of the section; and (2) the values of the Nusselt (Nu) number obtained in the literature are understated by comparison, and Nu depends on the Peclet number (Pe), in the laminar region.

AD-259 609 Div. 25
(17 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
EFFECT OF ULTRA SOUND ON THE INTENSIFICATION OF HEAT EXCHANGE (Vliyaniye Ul'trazvuka Na Intensifikatsiyu Teploobmena),
by A. P. Tretyakov and Chen Khua-Din. 2 June 61, 4p. incl. illus. (Trans. no. MCL-1153 of Teoploenergetika 11:64-66, 1960)
Unclassified report

DESCRIPTORS: *Ultrasonics, *Heat transfer, Heat, Experimental data, Technological intelligence, USSR.

AD-259 612 Div. 25
(17 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CERTAIN EXACT SOLUTIONS OF THE EQUATIONS OF UNSTEADY MOTION IN MAGNETIC HYDRODYNAMICS,
by Yu. P. Ladikov. 26 May 61, 7p. (Trans. no. MCL-1072 of Doklady Akademii Nauk SSSR 137: 303-306, 1961)
Unclassified report

DESCRIPTORS: *Plasma physics, Magnetic fields, *Plasma oscillations, *Magnetohydrodynamics, Mathematical analysis, Partial differential equations, USSR, Technological intelligence.

A class of magnetohydrodynamic motion is investigated, in which the radial velocity is a linear function of the radius. (Author)

AD-259 613 Div. 25, 2
(17 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
IONIZATION IN THE EARTH'S IONOSPHERE, AND THE ENERGY OF SHORTWAVE SOLAR UV RADIATION,
by G. S. Ivanov-Kholodnyy. 26 May 61, 8p. incl. table (Trans. no. MCL-1073 of Doklady Akademii Nauk SSSR 137:327-330, 1961)
Unclassified report

DESCRIPTORS: *Ionosphere, Molecules, Ions, Dissociation, Recombination reactions, Upper atmosphere, Oxygen, Nitrogen, Chemical reactions, *Ultraviolet radiation, *Solar energy, *Gas ionization, Sounding rockets.

Data obtained from artificial satellites and rockets concerning the ionosphere are discussed. The basic process for neutralization in the ionosphere is the dissociative recombination of molecular ions; atomic ions become molecular due to the overcharge processes. The total number of recombination and ionization processes in an atmospheric column of 1 sq cm cross section 3 x 10 to the 11th to the 13th power per sq cm per a second. The new concepts of the basic processes in the ionosphere agree with recent data on SW solar radiation, which contains 5 to 10 times 10 to the 11th power quanta per sq cm per sec for spectral regions of 800 or less Angstroms. (Author)

AD-259 617 Div. 25
(17 July 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CALCULATING A WELDING ARC IN A TRANSVERSE MAGNETIC FIELD (K Raschetu Svarochnoy Dugi V Poperechnom Magnitnom Pole)
by G. B. Serdyuk. 2 June 61, 11p. (Trans. no. MCL-947 of Avtomaticheskaya Svarka 11:31-38, 1960)
Unclassified report

DESCRIPTORS: *Arc welding, *Electric arcs, Magnetic fields, Mathematical analysis, Theory, Non-linear differential equations, USSR, Welding.

CONCLUSIONS: The equation of dynamic equilibrium of a welding arc situated in a transverse magnetic field was analyzed. Approximate expressions are given for individual members of this equation: (1) inertia forces of the gaseous stream of the arc, (2) aerodynamic resistance of the medium, and (3) electrodynamic elastic force of

the magnetic field of deformed arc column. Calculations of an arc with magnetic deformation are more difficult in connection with the necessity of solving nonlinear differential equations, which is possible only during the application of special methods. On the basis of the theoretical analysis a rated dependence was obtained between the current, the intensity of the controlling field, and the radius of curvature of the electric arc which is in a constant and uniform magnetic field. (Author)

AD-259 622 Div. 25
(17 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ON THE BENDING OF THE CURVE OF A THIN-WALLED TUBE, THE CROSS SECTION OF WHICH HAS A FORM CLOSE TO CIRCULAR, IN THE PRESENCE OF EXTERNAL OR INTERNAL PRESSURE,
by D. D. Kostovetskiy. 15 May 61, 9p. incl. illus. (Trans. no. MCL-928 of Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Mekhanika I Mashinostroyeniye 6:127-131, 1959)
Unclassified report

DESCRIPTORS: *Pipes, *Deformation, Cylindrical bodies, Structural shells, Pressure, USSR, Potential theory, Integral equations, Differential equations.

The shifts and stresses are determined in the curve of a thin-walled tube the cross section of which has a form slightly deviating from the circular in the case of the simultaneous action of bending moments and internal or external pressure. The deviation of the cross section from the circular form was found to have a considerable effect on the stress and deformation state of the tube. (Author)

AD-259 625 Div. 25, 7
(17 July 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
INVESTIGATING SEMICONDUCTOR THERMOELEMENTS (Issledovaniye Poluprovodnikovykh Termoelemntov),
by Yu. N. Malevskiy and A. S. Okhotin. 14 June 61, 17p. incl. illus. table (Trans. no. MCL-916 of Teploenergetika 2:78-87, 1960)
Unclassified report

DESCRIPTORS: *Semiconductors, *Thermocouples, *Thermoelectricity, Alloys, USSR, Solar cells, Lead alloys, Bismuth alloys, Antimony alloys, Tellurium alloys, Intermetallic compounds, Tellurides, Antimonides, Nickel alloy.

Contents:
Selecting materials for thermoelements
Preparation of lead telluride
Preparation of the Bi2Te3-Sb2Te3 system
Properties of materials and their dependence upon temperature
Technology of preparing thermoelements
Power characteristics of the thermoelement on the base of PbTe and Bi2Te3-Sb2Te3 alloys
Specificity of solar thermogenerators

AD-259 640 Div. 25, 14
(17 July 61) OTS price $1.60

Brown U. Div. of Applied Mathematics, Providence, R. I.
THE VISCO-PLASTIC FLOW OF A LONG THICK TUBE UNDER INTERNAL PRESSURE,
by Edmund J. Appleby. June 61, 14p. incl. illus. (Rept. no. C11-69)
(Contract Nonr-56210, Proj. NR-064-406)
Unclassified report

DESCRIPTORS: *Plastic flow, *Plastic tubing, *Plasticity, Deformation, Stresses, Shear stresses, Viscosity, Creep, Pressure, Materials, Solid state physics, Partial differential equations, Integration, Mechanical properties.

A study is made of the behaviour of a long hollow circular cylinder, made of a rigid visco-plastic material and having its ends restrained from motion in the axial direction, when it is subjected to internal pressure. The basic problem of plane strain with rotational symmetry, being one of those which most readily yield to treatment in plasticity, is a standard problem in this field, and has been studied by investigators in a variety of different ways for the ideally plastic and the elastic plastic material. An analysis is made for an ideal material, a visco-plastic Bingham solid, which is undeformable until the stresses reach their yielding values, and then under stresses which are in excess of their yielding values, when the flow is not restricted by adjacent regions of nonplastic material, has strain velocities dependent on this stress excess or overstress. The material does not exhibit work hardening, and as it is known that in the fully plastic state, volume changes are negligible, it is assumed to be incompressible. (Author)

AD-259 648 Div. 25, 14
(17 July 61) OTS price $8.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
INTERNALLY ABLATING COMPOSITES.
Rept. for Aug 60-Mar 61 on Research on Solid Propellants,
by Franklin A. Vassallo. Apr 61, 92p. incl. illus. table.
(Contract AF 33(616)6886)
(ASD TR 60-697, pt. 2, vol. 1)
(ARPA Order no. 24-60, Task no. 6)
Unclassified report

DESCRIPTORS: *Ablation, Cooling, Heat transfer, Vaporization, High temperature research, Melting, Solids, *Rocket motor nozzles, Materials, Heat resistant polymers, Steel, Copper, Polymers, Ethylenes, Fluorides, Plastics, Resins, Mathematical analysis, Theory, *Sweat cooling.

An analysis was made of composite materials so designed that high heat flux at one face will cause one phase to act as an energy absorbing material by melting, vaporizing, or decomposing and thereby flowing out through the heated surface and in so doing cool the other phase and maintain its dimensional stability. This combined process is referred to as internal ablation. Results of numerical analysis were generalized and expressed by dimensionless groups whose relations are shown in chart form. The initially considered case of 1-dimensional heat flow into a semi-infinite body was followed by a similar treatment for the finite body. The curves prepared allow a computation of the duration of the 2-phase body for many combinations of material and environmental characteristics. In an illustrative calculation, the duration of the 2-phase body is several times greater than that of the non-porous matrix. (Author)

AD-259 661 Div. 25
(17 July 61) OTS price $5.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
ELECTRON MOBILITY IN CADMIUM SULPHIDE SINGLE CRYSTALS AT LOW TEMPERATURES.
Master's thesis,
by Louis Joseph Del Do. Mar 61, 45p. incl. illus. 15 refs. (Rept. no. GNE/Phys/61-4)
Unclassified report

DESCRIPTORS: *Solid state physics, *Single crystals, *Cadmium compounds, Sulfides, *Hall effect, *Semiconductors, Electrical properties, Temperature, Resistance, Electrons, *Electron transitions, Low temperature research, Measurement, Determination, Voltage, Theory.

The dependence of electron mobility on temperature for charge carriers in single crystals of CdS was investigated between 4.2 and 273 K. The mobility, mu, was obtained by determining the value of the Hall constant and the crystal resistivity. The crystals were shaped into parallelpipeds and prepared for electrical measurements by applying indium contacts on their surfaces by ultrasonic techniques. Electrical measurements were conducted in a liquid helium cryostat. The mobility, the Hall constant, the resistivity, and the charge carrier density were plotted as a function of 1/T. The mobility increased rapidly from 273 K to a maximum near 25 K and then decreased sharply near 4.2 K. Analysis of the data indicated that the experimental behavior of the mobility of charge carriers at low temperatures can be explained in terms of impurity band conduction.

AD-259 662 Div. 25, 20, 4
(17 July 61) OTS price $6.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
SOME LUMINESCENT PROPERTIES OF THE MIXED PHENYL- AND p-BIPHENYLYL-SUBSTITUTED SILANES UNDER ULTRA-VIOLET, GAMMA AND BETA EXCITATION.
Master's thesis,
by Carl Graham Weis. Mar 61, 64p. incl. illus. tables, 29 refs. (Rept. no. GNE/Phys/61-21)
Unclassified report

DESCRIPTORS: *Luminescence, *Silanes, Beta counters, *Phenyl radicals, *Radiation counters, Phosphors, Scintillation counters, Anthracenes, Gamma counters, Beta particles, Ultraviolet radiation, Fluorescence, Pulse height analyzers, Excitation, *Luminescent materials, *Silicon compounds.

Luminescent properties of triphenyl-p-biphenylylsilane (silane I), biphenyl-di-p-biphenylylsilane (silane II) and phenyl-tri-p-biphenylylsilane (silane III) have been investigated. In comparing these phosphors with anthracene the following results were obtained: (a) Silane I is 8% less effective than anthracene in its gamma detecting ability. (b) The pulse height of the silanes is about 40% - 45% that of anthracene. (c) Each of the silanes is about 70% as efficient a beta detector as anthracene. Fluorescence spectra for each of the silanes under ultraviolet and beta stimulation are reported. Peak emission wave-lengths are 400, 400, and 450 millimicrons for Silane I, II, and III respectively. Fluorescence decay constants of 2.53-2.54, 2.62-2.63 and 3.29-3.31 nanoseconds were found for Silane I, II, and III. (Author)

AD-259 676 Div. 25
(17 July 61) OTS price $8.60

North Carolina U., Chapel Hill.
A STUDY OF DISLOCATIONS IN SILVER CHLORIDE.
Doctoral thesis,
by Max Gardner Miller. June 61, 91p. incl. illus. 49 refs.
(Contract AF 49(638)865)
(AFOSR-946) Unclassified report

DESCRIPTORS: *Silver compounds, Chlorides, Solids, *Solid state physics, Deformation, Lattices, Tensile properties, Mechanical properties, Metallurgy.

Dislocations in AgCl have been studied through the use of three different types of experiments: absorption edge measurements; tensile tests; decoration experiments. A shift of 1A per percent plastic deformation could have been detected. This is much smaller than the shift of 12A per percent plastic deformation found by Chiarotti. Experiments on the tensile properties of AgCl show that the history of preparation and impurity content of the crystals affects these properties. Tests were run on copper doped samples which showed that the divalent state exhibited strain aging whereas the crystal containing copper in the monovalent state showed no strain aging. Quenching raises the initial yield point by 350% with the evidence pointing toward a large part of the increase being due to quenched in point defects. Photolytic silver in the interior of AgCl locks dislocations and raises the initial yield stress by 60%. Strain aging was found to be accumulative. Part of the increase in yield stress is irrecoverable. A technique for decorating dislocations deep in the interior of AgCl crystals using the Haynes-Shockley method was extended. (Author)

AD-259 679 Div. 25, 30
(17 July 61) OTS price $1.60

Washington Square Coll., New York U., N. Y.
A STUDY OF THE FAR INFRARED PROPERTIES OF CRYSTALS.
Scientific rept. no. 14, 1 Dec 60-28 Feb 61,
by J. H. Rohrbaugh. 28 Feb 61, 12p. incl. illus.
(Contract AF 19(604)2673, Continuation of Contract AF 19(604)1115)
(AFCRL-326) Unclassified report

DESCRIPTORS: *Crystals, Infrared radiation, Infrared spectroscopy, *Infrared equipment, Diffraction gratings, Mirrors, Frequency, Temperature, Optics, Focusing.

Calculations are presented to show how the radiation travels through the spectrometer from the grating to the Galay cell for that part of the path involving the parabolic mirror and paraboloidal cap near the receiving system. A new exit slit was introduced into the system and calculations were made. Improvements in the mechanical, optical and electrical parts of the spectrometer are reported. (Author)

AD-259 684 Div. 25, 8, 4
(17 July 61) OTS price $4.60

Naval Ordnance Lab., Corona, Calif.
FOUNDATIONAL RESEARCH PROJECTS.
Quarterly rept. Jan-Mar 61.
1 June 61, 45p. incl. illus
(NAVWEPS rept. no. 7176) Unclassified report

DESCRIPTORS: High temperature research, *Polymers, *Magneto-optic rotation, Silicon, Infrared spectroscopy, *Semiconductors, Guided missile antennas, *Antennas, Slot antennas, Solid state physics, Digital systems, Linear systems, Scientific research, Noise generators, Heat resistant polymers, *Communications theory, Microwaves, Antenna radiation patterns, *Microwave equipment, Transistors, Phosphines, Nitrides, Azides, Infrared radiation, Crystals, Lattices, Absorption, Negative resistance circuits, Thin films.

Contents:
Trinary number coders, by R. L. Conger
Thin film shift register, by L. T. Long
Cross-linking agents for the (R2PN)x polymers, by D. L. Herring
Bisperfluoropropylphosphinic nitride, by G. Tesi and C. M. Douglas
Dimethylphosphinic azide and chloromethylphosphinic diazide, by P. J. Slota
An attempt to react trimeric dichlorophosphinic nitride with diazomethane, by P. J. Slota
Magneto-optical research, by J. L. Tomlinson
Solid state microwave generators, by C. Kaloi
Small antenna study, by G. E. Ryno
Lattice absorption bands observed in silicon by means of spectral emissivity measurements, by D. L. Stierwalt and R. F. Potter

AD-259 695 Div. 25, 4, 9
(17 July 61) OTS price $3.60

Polytechnic Inst. of Brooklyn, N. Y.
PROPAGATION OF SOUND IN A REACTING GAS MIXTURE NEAR EQUILIBRIUM,
by J. J. Roseman and V. D. Agosta. June 61, 32p. 12 refs. (Rept. no. PRL-61-12)
(Subcontract to Allegany Ballistics Lab., Hercules Powder Co., Contract NOrd-16640)
Unclassified report

DESCRIPTORS: *Sound, *Propagation, Gases, Gas flow, Chemical reactions, *Sound transmission, Differential equations, Thermodynamics, Physical chemistry, Acoustics.

The significant results obtained in research are summarized. A generalized differential equation for the propagation of a pressure pulse is obtained which is good for all values of the reaction rate. The physical significance of the two sound speeds, equilibrium speed of sound (ae) and frozen speed of sound (af), is explained on the basis of the above equation. For an instantaneous reaction, the state and composition variables are shown to be representable both physically and as solutions of the characteristic differential equations, as step functions and the reaction rate as an impulse function. Explicit expressions are obtained for ae and af. (Author)

AD-259 696 Div. 25
(17 July 61) OTS price $9.10

Polytechnic Inst. of Brooklyn, N. Y.
APPLICATION OF BIOT'S VARIATIONAL PRINCIPLE IN HEAT CONDUCTION,
by Thomas J. Lardner and Frederick V. Pohle. May 61, 100p. incl. illus. tables, 70 refs.
(PIBAL rept. no. 587)
(Contract AF 49(638)302, Proj. 9782)
(AFOSR-932) Unclassified report

DESCRIPTORS: *Thermal conductivity, Mathematical analysis, Bibliography, *Heat transfer, Vector analysis, Partial differential equations, Thermodynamics, Entropy, Specific heat, High temperature research.

Biot's variational principle for heat conduction is applied to the solution of a number of one-dimensional problems. These problems illustrate the applicability of the principle to problems involving prescribed heat flux boundary conditions and to problems with temperature-dependent material properties. (Author)

AD-259 697 Div. 25
(17 July 61) OTS price $3.60

Polytechnic Inst. of Brooklyn, N. Y.
DYNAMIC RESPONSE OF PLASTIC CIRCULAR CYLINDRICAL SHELLS UNDER LATERAL AND HYDROSTATIC PRESSURES,
by R. Sankaranarayanan. June 61, 32p. incl. illus. table (PIBAL rept. no. 573)
(Contract Nonr-83917, Proj. NR 064-427)
Unclassified report

DESCRIPTORS: *Cylindrical bodies, Structural shells, *Dynamics, Hydrostatic pressure, Pressure, Stresses, Deformation, Load distribution, Plasticity, Mathematical analysis, Equations.

A circular cylindrical shell clamped at one end and free at the other is subjected to uniform lateral and hydrostatic pressures. The deformations of the shell due to an exponentially decaying impulsive loading are obtained. The maximum radial deformation is adopted to indicate the carrying capacity of the shell under dynamic loading. It is found that in the short shell range, the carrying capacity of the shell under hydrostatic pressure is considerably less than that under lateral pressure alone. (Author)

AD-259 698 Div. 25, 8
(18 July 61) OTS price $2.60

Institute of Optics, U. of Rochester, N. Y.
BAND STRUCTURE OF SOLID ARGON,
by R. S. Knox and F. Bassani. Apr 61, 23p. incl. illus. tables (Rept. no. 8)
(Contract AF 49(638)432; In cooperation with Argonne National Lab., Argonne, Ill.)
(AFOSR-950) Unclassified report

DESCRIPTORS: *Argon, *Solids, *Solid state physics, Rare gases, Low temperature research, Conductivity, Electric fields, Electrons, Lattices, Crystals, *Brillouin zones, Solidified gases.

The OPW orthogonolized plane wave method in the perturbation approximation of Bassani and Celli is used to compute the lowest-lying conduction states in (fcc) solid argon at the symmetry points Gamma, X, L, and K. The 3s and 3p valence bands are treated by tight-binding theory. The potential used in the computation consists of a sum of effective atomic potentials in which a free-electron-like expression is used for the exchange contribution. The lowest conduction state appears to be s-like (Gamma 1), lying 12.4 ev above the highest valence state (Gamma 15). The results of the computation are compared with present theoretical and experimental knowledge of the electronic structure of the solid rare gases. (Author)

AD-259 703 Div. 25, 17
(17 July 61) OTS price $3.60

Nuclear Development Corp. of America, White Plains, N. Y.
SOLUTION RATES AND EQUILIBRIUM SOLUBILITY OF NICKEL AND IRON IN LIQUID LITHIUM,
by B. Minushkin, 30 June 61, 37p. incl. illus. tables, 21 refs. (Rept. no. NDA 2141-1)
(Contract Nonr-285700)
Unclassified report

DESCRIPTORS: *Lithium, *Liquid metals, *Nickel, *Iron, *Solubility, *Solutions, Determination, *Transport properties, Reaction kinetics, High temperature research, Chemical equilibrium, Theory, Chemical reactions.

The equilibrium solubility and solution rates of Ni and Fe in Li were measured from 540 to 825 C and 662 to 760 C, respectively. The data were obtained by measuring the solute concentration as a function of time of contact, using a liquid sampling technique. The equilibrium solubility of Fe in Li was 27 ppm at 662 C and 85 ppm at 760 C. Both Ni and Fe dissolved in Li at a very high rate. Saturation of the experimental system, which had a surface area-to-volume ratio of 1/0.57 cm, occurred in less than 0.5 to 1.5 hr. The solution rate constants for Ni in Li stirred at 54 rpm were 19 cm/hr at 680 C, 29 cm/hr at 730 C, and 39 cm/hr at 780 C. The solution rate constant for Fe in Li at 662 C under nominally static conditions was estimated to have a lower limiting value of 2.5 to 3.0 cm/hr. The solution processes are believed to be partially diffusion limited over the temperature range and stirring rates investigated.

AD-259 714 Div. 25, 8, 17
(18 July 61) OTS price $7.60

Energy Conversion Lab., Mass. Inst. of Tech., Cambridge.
THEORETICAL AND EXPERIMENTAL RESEARCH ON THERMOELECTRICITY,
15 Jan 61, 74p. incl. illus. (Scientific rept. no. 4)
(Contract AF 19(604)4153)
(AFCRL-122)
Unclassified report

DESCRIPTORS: *Semiconductors, *Thermoelectricity, Thermal conductivity, Materials, High temperature research, Intermetallic compounds, Molybdenum alloys, Tellurium alloys, Bismuth alloys, Antimony alloys, Selenium alloys, Cadmium alloys, Mercury alloys, Mathematical analysis, Diodes.

This study covers research during the past year on the preparation and evaluation of compound semiconductors, on criteria for the selection of thermoelectric materials, the development of high temperature measuring apparatus, and studies of different mechanisms of thermal conduction. Crystals of the semiconductor alloy $Bi_2Se_6Sb_{60+x}Te_{150-x}$ have been prepared and the Seebeck coefficient a, electrical resistivity and thermal conductivity k, have been measured at room temperature. Specimens of the alloy system Mo-Te have been prepared and the crystal structure of the ditelluride determined. Some specimens of Lead Telluride have been prepared for the investigation of the anamolous temperature dependence of thermal conductivity in that material. Criteria for the determination of optimum impurity doping in thermoelectric materials are derived and discussed for the two cases of optimum constant impurity doping and optimum variable impurity doping. A high temperature thermal conductivity apparatus is described and measurements of k and a of Bismuth Telluride in the range 300 K to 550 K are presented. A room temperature impulse measurement of the thermal diffusivity of semiconductors is described. Small signal characteristics of thermoelectric heat pumps are briefly discussed and the design of an Esaki diode oscillator is presented. (Author)

AD-259 718 Div. 25
(18 July 61) OTS price $6.60

Geophysical Interpretation Co., Houston, Tex.
STUDIES OF AMBIENT NOISE.
Final technical rept.
18 May 61, 60p. incl. illus.
(Contract Nonr-272600)
Unclassified report

DESCRIPTORS: Oscillation, Bubbles, *Underwater sound, *Noise, Cavitation noise, Acoustics, Mathematical analysis, Partial differential equations.

Contents:
On the radial oscillations of bubbles
Surface phenomena as sources of underwater acoustic noise
Bubbles as a source of ambient noise
A rotatory disturbance on the surface of a semi-infinite, compressible, non-viscous body of water

AD-259 733 Div. 25, 8, 30
(18 July 61) OTS price $1.60

Washington Square Coll., New York U., N. Y.
RESEARCH AND DEVELOPMENT FOR THE STUDY OF THE STORAGE OF ELECTRICAL ENERGY WITH THE HELP OF PERSISTENT INTERNAL POLARIZATION IN PHOSPHORS.
Quarterly progress rept. 1 Mar-31 May 61, by H. Kallmann and J. Rennert. June 61, 9p. incl. illus.
(Contract DA 30-069-ORD-3075, Proj. TN2-8106)
Unclassified report

DESCRIPTORS: *Polarization, Phosphors, Zinc compounds, Cadmium compounds, Sulfides, *Electrical effects, Energy, Low temperature research, Liquefied gases, Nitrogen, Storage, Waxes, Experimental data, Solid state physics.

Castor wax inbedding matrices for zinc cadmium sulfide 6Y1 phosphor layers in high concentrations enchances the magnitude of persistent internal polarization by about one order of magnitude. The magnitude of the polarization increases with increasing concentration of the wax added. Prolonged evacuation of P.I.P. samples in silicone matrices results in a decrease of polarizability of such layers. The original polarizability is recovered slowly as air is re-admitted. An improved design of metal P.I.P. sample housing for polarization studies at reduced pressures and low temperatures is described. (Author)

AD-259 738 Div. 25
(18 July 61) OTS price $2.60

Naval Ordnance Lab., White Oak, Md.
ANTIFERROMAGNETIC COMPOUNDS,
by H. A. Alperin and S. J. Pickart. 10 Apr 61, 1v. incl. illus. tables, 128 refs. (Rept. no. NOLTR 61-18)
Unclassified report

DESCRIPTORS: *Ferromagnetic materials, Nuclear spins, Ferrites, Ferromagnetism, *Magnetic materials, Transition elements, Crystals, *Antiferromagnetism, Crystal structure, Lattices, Atomic structure, Chemical bonds, Paramagnetic crystals, Tables, Metallic compounds, Complex compounds, *Bibliography, Materials, Physical properties.

A table of antiferromagnetic compounds in which the moments of the magnetically active cations arise from incomplete 3d, 4d, or 5d shells has been compiled. Listed for each compound are the crystal symmetry, the Neel and paramagnetic Curie temperatures, the effective and actual moments per atom, the magnetic structure, and references to the literature. (Author)

AD-259 757 Div. 25, 12
(18 July 61) OTS price $13.50

Research and Advanced Development Div., AVCO Corp., Wilmington, Mass.
STUDIES ON THE APPLICATION OF X-RAY AS A LETHAL MECHANISM OR DECOY DISCRIMINATION TECHNIQUE. VOLUME 2. STUDIES ON THE DYNAMIC RESPONSE OF SHELL STRUCTURES AND MATERIALS TO A PRESSURE PULSE,
by P. P. Radkowski, J. S. Humphreys and others. July 61, 194p. incl. illus. tables.
(Contract AF 29(601)2560)
(AFSWC TR 61-31, vol. 2) Unclassified report

DESCRIPTORS: *X-rays, Elastic shells, Shock waves, Deformation, *Re-entry vehicles, Theory, Structures, *Pressure, Mathematical analysis, Cylindrical bodies, Spheres, Load distribution, Attenuation, Plasticity, Plastics, Stresses, Materials, High pressure research, *Structural shells.

The application of X-radiation as a lethal mechanism or decoy discrimination technique is studied theoretically. Volume 1(Secret) applies the studies of this volume to vulnerability analysis of the MARK 4 re-entry vehicles and decoys. This volume presents the unclassified studies of the dynamic response of shell structures and materials to a pressure pulse. The following subjects are treated: (1) dynamic buckling criterion of shallow shells under uniform impulsive loading, (2) modal analysis of axisymmetric buckling of clamped, shallow, spherical shells, (3) dynamic membrane stresses in a circular elastic shell, (4) dynamic collapse of a rigid-plastic ring under a distributed impulsive load, (5) comparison of rigid-plastic-ring results with experiment, (6) plastic collapse of ring with rigid outer layer, (7) shock wave propagation in solid and compactible media and (8) large elastic deformations of dynamically loaded rings. (Author)

AD-259 762 Div. 25, 17, 4
(18 July 61) OTS price $2.60

Eagle-Picher Research Labs., Miami, Okla.
RESEARCH INVESTIGATIONS IN THE PHYSICAL CHEMISTRY AND METALLURGY OF SEMICONDUCTING MATERIALS.
Quarterly rept. no. 4, 15 Feb-15 May 61,
by K. E. Bean and R. J. Starks. 15 May 61, 24p. incl. illus. tables.
(Contract DA 36-039-sc-85131)
Unclassified report

DESCRIPTORS: *Semiconductors, Materials, *Boron, Single crystals, Production, Preparation, Physical properties, Chemical properties, Electrical properties, Impurities, Silicon, *Boron compounds, *Bromides, Synthesis, Purification, Separation, Carbon, Determination.

Si was the only impurity of any significance detected by spectrographic analyses in the B produced. Si is quite thoroughly removed from $BBr_3$ during fractional distillation. B-coated graphite electrodes, of large diameter, were used in an attempt to completely eliminate the possibility of contamination from carbon. Initial heating up of the B filament, in the H reduction unit, is now being carried out in helium. This has eliminated cracking of the filament which occurred when the initial heating up was in hydrogen. Work has been started toward improving the present method of determining C in boron. Boron bars were successfully float zoned in a vacuum. Zone passes were carried out at pressures from 0.7 to 10 microns of mercury. Bars produced under these pressures were superior to those zoned in inert gas ambient. P-N junctions were obtained in vacuum zoned material by diffusion of N into the crystals. (Author)

AD-259 770 Div. 25, 7
(17 July 61) OTS price $2.60

Rome Air Development Center, Griffiss Air Force Base, N. Y.
CRYOGENIC THERMOELECTRIC COOLING,
by John E. McCormick. May 61, 23p. incl. illus.
(RADC TN 61-54)
(Proj. no. 5561)
Unclassified report

DESCRIPTORS: *Thermoelectricity, *Cooling, Refrigeration systems, Nitrogen, Liquefied gases, Thermopiles, Thermocouples, *Cryogenics, Thermal conductivity.

The thermodynamics of thermoelectric cooling are discussed. A hypothetical thermoelectric device exhausting heat to a liquid nitrogen bath is described, and the limitations of such a device are considered. Phenomena that may improve the performance of thermoelectric materials in the low temperature range are examined. (Author)

AD-259 827 Div. 25, 13, 1
(31 July 61) OTS price $3.60

Applied Mathematics and Statistics Lab., Stanford U., Calif.
ON MODELS FOR THE PROBABILITY OF FATIGUE FAILURE OF A STRUCTURE,
by Emanuel Parzen. 17 Apr 59, 29p. incl. illus. 21 refs. (Technical rept. no. 45)
(Contract N6onr-25140, Proj. NR 342-002)
Unclassified report

Prepared for presentation to the Structures and Materials Panel, Advisory Group for Aeronautical Research and Development, North Atlantic Treaty Organization, Paris, France, April 13-25, 1959.

DESCRIPTORS: *Structures, Materials, *Fatigue (Mechanics), Statistical analysis, Probability, Airframes, Design.

The paper represents an attempt by a person trained in probability theory to survey some of the problems involved in evaluating structural safety. A review is presented of the probabilistic considerations involved in evaluating the strength of materials, and the construction of so called S-N curves. A probabilistic model for the life before fatigue failure of a structure is developed. (Author)

AD-259 839 Div. 25, 4
(18 July 61) OTS price $9.60

Guggenheim Jet Propulsion Center, Calif. Inst. of Tech., Pasadena.
ABSOLUTE INFRARED INTENSITY MEASUREMENTS FOR NO2 and N2O4,
by A. Guttman. June 61, 112p. incl. illus. tables, 28 refs. (Technical rept. no. 38)
(Contract Nonr-22003, Proj. NR 015 401)
Unclassified report

DESCRIPTORS: *Nitrogen compounds, *Dioxides, *Tetroxides, Infrared spectroscopy, Absorption, Dissociation, Heat of reaction, Measurement, Determination, Gases, Liquids, Chemical equilibrium.

The integrated intensities as a function of temperature were measured for one NO2 and for four N2O4 combination bands in the spectral region from 1 to 5 microns. The temperature was varied from 50 to 100 C for the gas-phase studies and from 25 to 100 C for the liquid-phase experiments. In the spectral region from 5 to 15 microns, integrated intensities at 25 C were measured for one NO2 and for three N2O4 fundamental bands. Results from a series of absorption spectra were interpreted in accordance with the Wilson-Wells-Penner-Weber method. Measured intensities for N2O4 combination bands in the liquid and gas phases were compared and found to differ by less than 16% for 3 out of 4 combination bands studied; for the fourth band, the observed difference was about 50%. Results for all of the combination bands indicate that the integrated intensities vary approximately as 1/T in the temperature range under consideration. Absolute intensity data may be used for a spectroscopic determination of the heat of dissociation for gases in chemical equilibrium. For the reaction N2O4 yielding reversibly 2NO2, the heat of dissociation value, using the temperature dependence of the absorption bands, was 13.1 Kcal/(mole N2O4); this value is in fair agreement with the value of 13.7 Kcal/(mole N2O4) obtained by techniques utilizing density measurements. (Author)

AD-259 843 Div. 25, 19, 30
(20 July 61) OTS price $3.60

Coordinated Science Lab., U. of Illinois, Urbana.
(No title).
Progress rept. for Mar-May 61,
May 61, 34p. incl. illus.
(Contract DA 36-039-sc-85122)
Unclassified report

DESCRIPTORS: *Gyroscopes, *Vacuum systems, *Plasma physics, Delay lines, *Digital computers, Data processing systems, *Inertial navigation, Air traffic control systems, *Teaching machines, Statistical analysis, Ions, Sources, Gas ionization, Cesium, Numerical methods and procedures, Navigation, Shock waves.

AD-259 853 Div. 25
(20 July 61) OTS price $2.60

Servo Corp. of America, Long Island, N. Y.
STUDY OF INFRARED SOURCES.
Interim development rept. no. 3, 20 June-20 Sep 58,
by I. S. Finkelstein. 23 Oct 58, 25p. incl. illus. tables (Rept. no. SCA-8600-RQ-3)
(RADC TN 58-326) Unclassified report

DESCRIPTORS: *Infrared radiation, Sources, Spectrophotometers, Refractory materials, Oxides, Cermets, Ceramic materials, Alloys, Laboratory furnaces, Coatings, Magnesium compounds, Oxides, Measurement.

Research was continued on a study of infrared sources. A recording spectrophotometer was adapted to serve as an emission rather than as a transmission instrument. A furnace was also constructed for the purpose of heating solid bodies to high temperatures, of the order of 1000 C. The emission spectra of vitreous and ceramic bodies were traced. Samples of cermets, refractory oxides and alloys also were studied. In general, these all behaved more or less like gray bodies. One substance, polycrystalline MgO, showed significantly higher emission at about 12.8 microns than the remaining samples. The problem of using gaseous radiators received preliminary consideration. (Author)

AD-259 858 Div. 25, 20
(21 July 61) OTS price $3.60

Aerospace Corp., El Segundo, Calif.
THEORETICAL ELASTIC COLLISION FREQUENCY BETWEEN ELECTRONS AND NEUTRAL ATOMS IN A CESIUM PLASMA,
by Lawrence Baylor Robinson, 22 Mar 61, 32p. incl. illus. tables (Rept. no. TDR-594(1203-01) TR-2)
Unclassified report

DESCRIPTORS: *Elastic scattering, Probability, *Cesium, *Plasma physics, Electrons, Ions, Atoms, Quantum mechanics, Transport properties, Theory.

The elastic scattering cross sections and momentum transfer cross sections for the collisions of low energy electrons with atomic cesium have been calculated by the method of phase shifts. The scattering potential, used in the Schroedinger equation, is constructed from one electron-type wave function with appropriate screening constants. In addition to the potential arising because of the atomic electrons, a polarization potential is also used; the effect of exchange is considered only indirectly. This preliminary analysis reproduces the shape of the cross section versus energy curves as reported in some experiments but does not give detailed agreement. The theoretical cross sections are averaged over a Boltzmann distribution of electronic energies in the temperature range from 1000 K to 10,000 K. Averaged values of the collision (for momentum transfer) frequency between electrons and cesium atoms are also calculated. All results are presented both in graphical and tabular form. (Author)

AD-259 866 Div. 25, 6
(20 July 61) OTS price $4.40

Bell Telephone Labs., Inc., Whippany, N. J.
ON THE ENVELOPE OF A NARROW-BAND SIGNAL IN RANDOM NOISE,
by J. R. Brown, 1 June 61, 34p. (Technical rept. no. 5)
(Contract Nonr-246100, Proj. NR 261-111)
Unclassified report

DESCRIPTORS: *Detection, *Underwater sound, Naval research, Narrowband, *Noise, Sonar signals, Statistical processes, Probability, Signal-to-noise ratio, Statistical functions, Signals, Statistical analysis, *Underwater sound transmission, *Underwater sound signals.

Under consideration is a random process z(t) = s(t) + n(t), where s(t) and n(t) are narrow-band, stationary (wide sense) random processes. The amplitude A sub z(t), phase phi sub z(t) and the quadrature components x sub z(t) and y sub z(t) are defined as random processes in terms of the spectral representation of z(t). On the basis of these definitions formulas are derived for the autocorrelation and cross-correlation functions of the processes A sub z(t) and phi sub z(t). The extent to which z(t) is a good estimate of s(t) is considered. In particular, it is shown that this estimate continues to become better as the signal-to-noise power ratio increases. A maximum-likelihood estimate of x(t) based on the observations z (t sub 1), ... z(t sub n) is derived for a Guassian s(t) and it is shown that this estimate reduces to z(t) for n = 1, t sub 1 = t. The same thing is done for the two-dimensional processes (x sub s(t), y sub s(t)) and A sub s(t), phi sub s(t)). A theorem is stated which enables one to estimate directly the auto-correlation and cross-correlation functions of the amplitude and phase of a strictly stationary, ergodic process. In particular, it is shown that the two-dimensional process (A sub z(t),phi sub z(t)+ lambda sub ot) is strictly stationary and ergodic when x(t) is. (Author)

AD-259 867 Div. 25
(21 July 61) OTS price $4.60

California U., Berkeley.
THERMODYNAMIC BEHAVIOR OF LIQUID HELIUM THREE IN ITS POSSIBLE SUPERFLUID PHASE I,
by Toshio Soda and Ramabadhra Vasudevan, 1961, 41p. incl. illus.
(Contract AF 49(638)508; In cooperation with Calif. U., La Jolla)
(AFOSR-631) Unclassified report

DESCRIPTORS: *Low temperature research, Cryogenics, Helium, Isotopes, *Tritium, *Liquefied gases, *Brillouin zones, Quantum mechanics, Thermodynamics, Entropy.

The thermodynamic behavior of liquid He-3 in its possible superfluid phase is investigated by extending the methods of Brueckner et al. (Phys. Rev. 118:1442, 1960). They suggest that such a correlated phase can exist at very low temperatures due to the fact that there exist attractive D-state interactions near the Fermi surface. The free energy and the energy gap of the system for D-state interactions corresponding to different pure azimuthal modes are calculated at different temperatures. It is found that l equals 2; m equals 2 and l equals 2; m equals 1 modes correspond to the lowest free energy of the system near the critical temperature and near T equals 0. In the intermediate range of temperatures the free energy curves for the two modes are very nearly the same. The l equals 2; m equals 0 mode yields a higher free energy for all temperatures less than the critical temperature. The mixing of modes is investigated near the critical temperature. Any linear combination of all the modes l equals 2; m equals 0, 1, -1, 2 and -2 leads to a higher free energy which corresponds to the l equals 2; m equals 0 pure mode. The linear combination of l equals 2; m equals 0, m equals 1 and m equals 2 modes only leads to the lower free energy equal to the pure l equals 2; m equals 2 mode. (Author)

AD-259 872 Div. 25, 15
(21 July 61) OTS price $7.60

California U., Berkeley.
UNIQUENESS THEOREMS UNDER THE RADIATION CONDITION,
by Farouk M. Odeh, Aug 60, 74p. (Technical rept. no. 8)
(Contract Nonr-22260, Proj. NR 041-221)
Unclassified report

DESCRIPTORS: *Quantum mechanics, *Electromagnetic theory, Green's function, Potential theory, Partial differential equations, Integral equations, Sequences.

Uniqueness and existence theorems are given for the solutions of the time-independent Schroedinger's equation which satisfy Sommerfeld's radiation condition. It is shown that, under appropriate conditions, the radiating solution is the limit of the initial value solution of the time-dependent equation as the time grows indefinitely. It is also shown that the L2-solutions of the Schroedinger equation with imaginary energy tend to the radiative solution if the imaginary part of the energy tends to zero. Lastly, the radiation condition is shown to ensure uniqueness of the solutions to some electromagnetic problems involving infinite boundaries. (Author)

AD-259 879 Div. 25, 8
(21 July 61) OTS price $3.60

Geophysics Corp. of America, Boston, Mass.
STEADY-STATE SHIELDING RESPONSE OF AN IRRADIATED PLASMA.
Quarterly technical note no. 2,
by J. I. F. King. 15 June 61, 31p. (GCA Technical rept. no. 61-29-A)
(Contract AF 30(602)2380, Proj. 5561)
(RADC TN 61-127) Unclassified report

DESCRIPTORS: *Plasma physics, Plasma oscillations, Radio waves, *Electromagnetic waves, Radiofrequency, Attenuation, *Heating, Resistance, Excitation, Electrons, Density.

For a fairly broad range of certain nondimensional parameters it is possible to couple RF power incident on an inhomogeneous plasma with the resultant beam attenuation appearing as ohmic heating of the medium. The plasma reacts to this heating with a local rise in temperature and electron density which in turn alters the pattern of heat deposition. A closed form solution has been obtained for the plasma response to this heat input using the WKB solution. With an initial exponential distribution of electron density the solution predicts, after the transient response is washed out, the formation of a plasma shield in the form of a progressive invariant wave moving upstream at constant velocity toward the beam source. The shielding velocity and the shape of the wave is specified in terms of basic plasma parameters. (Author)

AD-259 882 Div. 25, 9
(24 July 61) OTS price $4.60

Stanford Research Inst., Menlo Park, Calif.
A STUDY OF THE FUNDAMENTALS OF MASS TRANSFER BY LITHIUM. DEVELOPMENT OF APPARATUS.
Final rept.
by M. F. Parkman. Jan 60, 39p. incl. illus. tables, 26 refs.
(Contract Nonr-211700)
Unclassified report

DESCRIPTORS: *Liquid metals, *Lithium, Fluid flow, *Transport properties, Instrumentation, *Corrosion, Fluid mechanics, Theory, Nickel,

Solubility, Diffusion, Viscosity, Handling, Purification, Chemical analysis, Design, Test methods, Physical properties, Determination, Laboratory equipment, Nickel tubing.

A study was made of the fundamentals of mass transfer by liquid Li in an attempt to develop a quantitative expression which will predict corrosion rates in a closed loop system. Efforts were made to determine whether the solution of Ni by Li could be described by a Leveque equation as modified by Linton and Sherwood (Chem. Eng. Prog. 46:258, 1950). The data obtained did not permit a conclusion to be made because of the large estimated error in physical property data and the lack of enough runs to test the various parameters. The apparatus consisted of a chamber with a furnace which contained the testing assembly, a handling section in which the various manipulations involving the Li were carried out, and a storage section in which the Ni tubes were stored and which provided space into which the testing assembly may be lifted for changing Ni tubes. Adjacent to the handling section are a large air lock for transferring materials in and out of the chamber, and a 4-in. high-vacuum pumping system. Materials were handled by means of neoprene gloves.

AD-259 883 Div. 25, 7
(24 July 61) OTS price $8.60

Eagle-Picher Research Co., Miami, Okla.
RESEARCH IN PURIFICATION OF CADMIUM SULFIDE CRYSTALS.
Technical documentary rept. for 15 Jan 60-15 Jan 61 on Solar and New Energy Conversion Techniques.
by R. H. Fahrig, K. E. Bean and others. Apr 61, 86p. incl. illus. tables, 10 refs.
(Contract AF 33(616)6203, Proj. 7116)
(ARL-14) Unclassified report

DESCRIPTORS: *Cadmium, *Sulphur, *Cadmium compounds, *Sulfides, Crystals, Purification, *Single crystals, *Solar cells, Preparation, Processing, Sintering, Heat treatment, Melting, Crystallization, Growth, Crucibles, Materials, Refractive index, *Semiconductors, Resistance, *Photoelectric cells, Synthesis.

The purification of Cd and S, and the subsequent synthesis of spectrographically pure CdS from the refined elements is described. The growth of large crystals of CdS by the method of vapor phase deposition is discussed. Modifications of apparatus and method are described and illustrated. The results of studies concerning raw materials, sintering, doping, diffusion and heat treating are given. A section dealing with the melting and crystallization of cadmium sulfide and other materials in a pressure melting furnace is presented. The testing and evaluation of cadmium sulfide crystals suitable for solar cells is described. (Author)

AD-259 911 Div. 25
(24 July 61) OTS price $4.60

Guggenheim Jet Propulsion Center, Calif. Inst. of Tech., Pasadena.
NON-EQUILIBRIUM EFFECTS ON CONDUCTIVITY AND ELECTRODE HEAT TRANSFER IN IONIZED GASES,
by Jack L. Kerrebrock. Nov 60, 29p. illus.
(Technical note no. 4)
(Contract AF 49(638)758)
(AFOSR-165) Unclassified report

DESCRIPTORS: *Conductivity, *Heat transfer, *Gases, *Ionization, Electrons, Tantalum, Electrodes, Argon, Potassium, Boundary layer.

A simple theory of non-equilibrium conduction in ionized gases has been developed, which accounts for the elevation of the electron temperature by energy gain in the electric field. It is assumed that the ionization is in equilibrium at the electron temperature. The theory yields a modified Ohm's law, such that the current density varies as a power of the electric field. The power is unity for gases at high temperatures, but can be very large at low gas temperatures. Measurements carried out with hot tantalum electrodes in an argon-potassium plasma at temperatures between 1500 K and 2500 K, at atmospheric pressure agree with the predicted variations of the conductivity with both density and gas temperature. This is regarded as a verification of the assumption of ionization equilibrium at the electron temperature. Both the theory and the experiments indicate that the augmentation of electrode heat transfer by Joule heating in the boundary layer is less important than equilibrium theory predicts it to be. (Author)

AD-259 912 Div. 25
(24 July 61) OTS price $1.10

Guggenheim Jet Propulsion Center, Calif. Inst. of Tech., Pasadena.
APPROXIMATE CALCULATIONS OF SPECTRAL EMMISSIVITIES IN THE INFRARED FOR HCl IN THE STRONG-LINE APPROXIMATION,
by L. D. Gray. May 61, 6p. incl. illus. tables.
(Technical rept. no. 37)
(Contract Nonr-22003, Proj. NR 015-401)
Unclassified report

DESCRIPTORS: High temperature research, Excitation, Spectrographic analysis, Numerical analysis, *Infrared spectroscopy, Hydrogen compounds, Chlorides, Quantum mechanics.

Spectral emissivities are computed and compared with previous data. At 600 K, the agreement is satisfactory, but there is quite a large discrepancy, particularly in the P branch, at 2400 K. For the strong-line approximation, it appears that vibration-rotation interaction and anharmonicity terms should be included in the calculation of spectral absorption coefficients at elevated temperatures. However, for the weak-line approximation, the harmonic-oscillator rigid-rotator model gives reasonable agreement with more elaborate numerical calculations. (Author)

AD-259 922 Div. 25
(24 July 61) OTS price $4.60

General Dynamics/Convair, San Diego, Calif.
INFRARED EMISSIVITY OF DIATOMIC GASES FOR THE ANHARMONIC VIBRATING ROTATOR MODEL,
by W. Malkmus and A. Thomson. 5 May 61, 47p. incl. illus. (Rept. no. ZPh-095)
(Contract AF 19(604)5554)
(ARPA Order no. 116) Unclassified report

DESCRIPTORS: *Infrared radiation, *Gases, *Molecules, *Spectrographic analysis, Atomic spectrum, Hyperfine structure, Hydrocarbons, Carbon dioxide, Oxides, Hydrogen compounds, Fluorides, Harmonic analysis, Harmonic oscillators, Hydrochloric acid, Chlorides.

In order to compute the emissivity of a diatomic gas, a simplified model of a diatomic molecule is assumed: an anharmonic oscillator with the first approximation to the vibration-rotation

interaction. For a given band, the frequency of emitted radiation is expressed as a quadratic function of the quantum number m, which is solved to express m as a function of omega. This expression is substituted for m in the equations used for computing the average line intensity and average line spacing. By applying the random Elsasser model to the fundamental and superposed higher order bands, closed-form solutions are obtained for the emissivity as a function of omega for certain limiting cases. Experimental data, where available, are used for the line widths and total absorption of the bands. The harmonic oscillator approximation is used to estimate strengths of higher order bands for which experimental data are not available. This analysis is applied to HCl, HF, CO, and NO for temperatures ranging from 300 to 7000 K. (Author)

AD-259 945 Div. 25, 8
(24 July 61) OTS price $2.60

Electronic Defense Labs., Mountain View, Calif.
MULTIPLE SCATTERING BY ARBITRARY CONFIGURATIONS IN THREE DIMENSIONS,
by Victor Twersky. 1 May 61, 22p. incl. illus. 15 refs. (Engineering rept. no. EDL-E61)
(Contract DA 36-039-sc-87475)
Unclassified report

DESCRIPTORS: Scattering, Diffraction, Differential equations, Mathematical analysis, Integral equations, *Electromagnetic wave reflections, *Electromagnetic waves, *Propagation, Special functions, Series.

A system of integral equations is derived in three dimensions which specifies the multiple scattering amplitudes for many objects in terms of corresponding functions for the isolated objects. For arbitrary configurations and large spacings, the amplitudes are expanded as series of single scattered functions and their derivatives; closed forms involving differential operators are derived for two objects. For arbitrary spacings, the amplitudes are expanded as series of spherical harmonics to obtain algebraic sets of equations relating the multiple and single scattering coefficients. Series expansions are available for arbitrary configurations, and closed forms are given for two small objects. (Author)

AD-259 947 Div. 25
(24 July 61) OTS price $7.60

Edo Corp., College Point, N. Y.
ELECTRO-ACOUSTIC PROPERTIES OF THE UNDERWATER SPARK DISCHARGE,
by Sheldon Gardner. 1 June 61, 74p. incl. illus. 34 refs. (Rept. no. 5480)
(Contract Nonr-228800)
Unclassified report

DESCRIPTORS: *Electroacoustic transducers, Electric discharges, Underwater sound, *Underwater sound generators, Pressure, *Plasma physics, Ions, Electrodes, Sparks, High temperature research, *Gas discharges, Switching circuits, Metal forming presses, Materials, Elasticity, Water, High pressure research, *Magnetohydrodynamics, Gas ionization, Shock waves, Echo ranging.

An investigation was made of the underwater spark discharge as a means of converting electrical to acoustic energy. The medium is a fundamental part of the transduction process. An underwater spark discharge is formed by switching an energy storage capacitor at a high voltage to a pair of submerged electrodes. An ionized plasma at high temperature and pressure is formed between the electrodes. The pressure within the plasma is transmitted to the surrounding water as a wave of compression similar to the shock wave created by an underwater explosion. An analysis of the electro-acoustic properties of the underwater spark is presented. The sonic energy radiated from the underwater spark discharge is discussed, and the directional properties of the radiated pressure are derived. Properties of the underwater spark discharge plasma as a circuit element are investigated. An electrical equivalent for the discharge circuit is developed from a knowledge of the variation of channel area with time. The theoretical results are compared with experimental ones for a fresh water underwater spark discharge. (Author)

AD-259 968 Div. 25, 14
(24 July 61) OTS price $3.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
EDGE EMISSION IN ZnSe SINGLE-CRYSTALS AT LOW TEMPERATURES.
Master's thesis.
by Oliver Warren Larson. Mar 61, 28p. incl. illus. tables, 10 refs.
Unclassified report

DESCRIPTORS: Single crystals, *Zinc compounds, *Selenides, *Fluorescence, Ultraviolet radiation, Absorption, Electron transitions, *Semiconductors, Spectrographic analysis, Theory, Low temperature research.

Fluorescence occurring near the fundamental absorption edge of UV-light irradiated ZnSe single crystals was examined between 4.2 K and 77 K. The ZnSe fundamental absorption edge, as determined by reflection techniques, was observed to decrease from 2.83 ev at 4.2 K to 2.82 ev at 77 K. Spectrographic analysis of edge emission at these temperatures indicated that the fluorescence near the edge could be explained on the basis of energy levels within the band, which were attributed to impurities, and on the basis of phonon interactions. Based on the results of this study, an energy model for ZnSe fluorescence has been proposed. The energy model contains the observed separation of the valence-to-conduction-band gap at 4.2 and 77 K and 2 impurity levels located within the gap. (Author)

AD-259 983 Div. 25
(24 July 61) OTS price $6.60

Institute for Molecular Physics, U. of Maryland, College Park.
COMPARATIVE STUDY OF EMPIRICAL INTERNUCLEAR POTENTIAL FUNCTIONS,
by Derek Steele, Ellis R. Lippincott, and Joseph T. Vanderslice, 19 July 61, 30p. incl. illus. tables (Technical rept. no. 2)
(Contract Nonr-59514, Proj. NR 051-425)
Unclassified report

DESCRIPTORS: *Nuclear physics, *Quantum mechanics, Dissociation, Spectrographic analysis, Nuclear, Atoms, Molecules, Nuclear energy levels, Functions, Tables.

A comparative study of empirical internuclear potential functions is carried out by using the criterion that a function should reproduce the experimental potential curves as determined by the Rydberg-Klein-Rees method. An additional criterion used was that a function should predict acceptable relations between the spectroscopic constants. The better functions are capable of reproducing the Ryberg-Klein-Rees experimental curves to an average error of 2-3% in bond dissociation energy. For r exceeds re, the corresponding average error is in the range of 1-2%. Functions which give acceptable agreement with the Rydberg-Klein-Rees curves usually give acceptable relations among the spectroscopic constants but notable exceptions were found with the Hulburt-Hirschfelder and Varshni functions. The Linnett and Hulburt-Hirschfelder functions sometimes predict spurious maxima for states where none are known or expected to exist. Indications are that no substantial improvement (errors of less than 1 percent in dissociation energy) can be made in predicting potential curves by proposing other empirical curves which have no theoretical or experimental foundations. Where r greatly exceeds re relatively large errors can be made in predicting interaction energies from empirical functions. (Author)

AD-259 984 Div. 25
(24 July 61) OTS price $1.60

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge.
SOME DIELECTRIC PROPERTIES OF TRIGLYCINE SULFATE, GUANIDINE ALUMINUM SULFATE HEXAHYDRATE, AND TRIGLYCINE TELLURATE,
by Franciszek Kaczmarek. June 61, 14p. incl. illus. tables, 18 refs. (Technical rept. no. 163)
(Contracts AF 19(604)6155 and Nonr-184110)
Unclassified report

DESCRIPTORS: *Glycines, *Sulfates, *Guanidines, Aluminum compounds, Hydrates, *Tellurium compounds, Dielectric properties, Ferroelectricity, Crystals, Measurement, Determination, Single crystals.

The dielectric constants of triglycine sulfate (TGS) and guanidine aluminum sulfate hexahydrate (GASH) were measured as a function of frequency up to about 23 kmc, and those of TGS also as a function of temperature. A peak-value shift of the dielectric constant of TGS toward higher temperature in the microwave region was observed. The coercive field of TGS, measured in a Sawyer-Tower circuit at 60 cps, increases very rapidly with decreasing temperature. In the low-frequency region, dielectric-constant measurements of triglycine tellurate, recently synthesized in this laboratory, showed no evidence of ferroelectricity; the dielectric constant proved of the order of 6. (Author)

AD-259 985 Div. 25
(24 July 61) OTS price $3.60

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge.
DIPOLES AND CHARGE CARRIERS IN RUTILE,
by A. von Hippel, J. Kalnajs, and W. B. Westphal. June 61, 32p. incl. illus. (Technical rept. no. 164)
(Contracts AF 19(604)6155 and Nonr-184110)
Unclassified report

DESCRIPTORS: *Titanium compounds, Oxides, Lattices, *Solid state physics, Structures, *Single crystals, Ions, Brillouin zones, *Semiconductors, Electrons, Electric dipole transitions.

Contents:
Structure and infrared vibrations
Hydrogen and deuterium in rutile single crystals
Reactions in hydrogen and oxygen
Oxygen loss and electron mobilization in rutile
Dielectric relaxation spectra of rutile
Electron injection and electric breakdown

AD-259 996 Div. 25, 17
(24 July 61) OTS price $2.60

Northwestern Technological Inst., Evanston, Ill.
SOLID SOLUTION STRENGTHENING IN ALPHA Cu-Al SINGLE CRYSTALS,
by T. J. Koppenaal and M. E. Fine. 15 July 61, 24p. incl. illus. 18 refs. (Technical rept. no. 5)
(Contract Nonr-122811)
Unclassified report

DESCRIPTORS: *Copper alloys, *Aluminum alloys, Single crystals, Solids, Solutions, Shear stresses, Determination, Crystals, Temperature, Alloys.

The critical resolved shear stress of alpha Cu-Al single crystals has been investigated as a function of composition, testing temperature, and strain rate. The strength, and its temperature and strain rate dependency increase markedly with Al content. The solid solution strengthening at 4.2 K is much larger than at room temperature. The activation energy for the low temperature dislocation cutting process increases from about 0.14 ev for a 0.5 at-% Al alloy to about 0.51 ev for a 14 at-% Al alloy. This result is attributed to an increase in the width of extended dislocation due to the known decrease in the stacking fault energy. In addition, the activation volumes at 4.2 and 77 K decrease with Al additions. No definite conclusions are reached concerning the solid solution strengthening in the 296 to 373 K range, but it is suggested that subgrains and cutting of subgrains are important. (Author)

AD-259 998 Div. 25, 30
(25 July 61) OTS price $5.60

Electromagnetic Materials Lab., U. of Michigan, Ann Arbor.
STUDY PROGRAM FOR A MAGNETIC TIMER UTILIZING THE PROPAGATION OF DOMAIN WALLS,
by W. W. Raymond and D. M. Grimes. July 61, 49p. incl. illus. tables, 30 refs. (Rept. no. 04316-2-T)
(Contract AF 49(638)986)
(AFOSR-949)
Unclassified report

DESCRIPTORS: *Magnetic materials, *Propagation, Delay elements, Magnetic properties, *Delay circuits, Switching circuits, Magnetostriction, Single crystals, Lattices, Spin, Magnetic fields, *Ferromagnetic materials, Non-linear differential equations, Partial differential equations, Nucleation, Relaxation time, Equations, *Timing circuits.

Investigations were made of the possible use of controlled domain wall propagation in a magnetic material as a continuously-variable time delay device. The equation of domain wall propagation is developed in terms of the fundamental parameters of the magnetic material. Conditions required for precisely controlled wall motion are discussed in terms of the shape and physical characteristics of the media. Those external

parameters which influence propagation are elaborated on in view of how they may be controlled to optimize the shape and velocity of the propagating magnetic discontinuity. Available data from the literature on the range in domain wall velocity in various materials are discussed and are compiled in tabulated form. Included are some results of experimental data. Several geometries are suggested for a suitable time delay system. In view of the high domain wall velocities, none of these systems are of use for time delays greater than several seconds. (Author)

# 26. PRODUCTION AND MANAGEMENT

AD-259 065 Div. 26, 14, 31
(6 July 61) OTS price $3.60

Material Lab., New York Naval Shipyard, Brooklyn.
SURVEY OF NAVAL WOOD BENDING APPLICATIONS, RESULTS OF.
Final rept.
9 Jan 61, 32p. incl. tables, 12 refs. (Lab. proj. 5829-1)
Unclassified report

DESCRIPTORS: *Wood, *Boats, Lifeboats, Processing, *Manufacturing methods, Handling, Storage, Standardization, Specifications, Laminates.

A review of the responses to the survey have revealed certain problems in the procurement, identification, handling and storage of white oak lumber currently purchased under MIL-0-2548A which may bear directly on the Bureau's contemplated revision and collation with MIL-L-2037B. Furthermore, the survey indicates considerable differences exist among the 14 Naval activities responding to the questionnaire in the knowledge and procedures used by shop personnel in performing the steam bending operation and in the facilities available to them. Consequently, the Laboratory recommends that the Bureau consider the publication of an instruction manual, which would take into account all of the problems indicated by the survey, for the purpose of unifying and standardizing the Naval procedures for oak lumber from its procurement to its final utilization in steam bending or laminating applications. The Laboratory would be willing to undertake the preparation of such an instruction manual; it is estimated its preparation would cost $5,000.00 and take six months to complete. (Author)

AD-259 145 Div. 26, 15
(7 July 61) OTS price $10.10

Applied Mathematics and Statistics Labs., Stanford U., Calif.
NEW CRITERIA FOR SELECTING CONTINUOUS SAMPLING PLANS,
by Frederick S. Hillier. 10 May 61, 122p. incl. tables, 22 refs. (Technical rept. no. 52)
(Contract Nonr-22553, Proj. NR 042-002)
Unclassified report

DESCRIPTORS: *Sampling, *Probability, *Quality control, Industrial production, Statistical analysis, Operations research, Applied mathematics.

New measures are proposed of the effectiveness of continuous sampling plans in adjusting to a process that has gone out of control. After the type of continuous sampling plan and the average outgoing quality limit value were selected, these new measures of effectiveness provide criteria for selecting a specific plan. The method of calculating the basic new criterion is indicated for the commonly used plans. Mathematical results about the behavior of a process out of control are presented for important special cases. Alternative views of these same problems are discussed. Illustrative computational results are presented. (Author)

AD-259 236 Div. 26, 17
(11 July 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
AUTOMATIC WELDING (SELECTED ARTICLES).
2 Feb 61, 25p. incl. illus. 23 refs. (Trans. no. MCL-270 of Avtomaticheskaya Svarka 4:pp. 36-46, 92-93, 1959)
Unclassified report

DESCRIPTORS: *Welding, Welds, Welded joints, Arc welds, Aging, *Titanium alloys, Aluminum alloys, Vanadium alloys, Heat treatment, Microstructure, Electrodes, Hardness, Plasticity, Mechanical properties, *Conferences, Quality control, Processing, Electric currents, Automation, USSR, Automatic.

Contents:
The aging of welded seams of a diphase alloy of titanium, alloyed by aluminum and vanadium, by S. M. Gurevich and V. F. Grabin
Conference of the committee for coordination of scientific and research operations in the realm of welding

AD-259 240 Div. 26
(11 July 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
EXPERIENCE IN USING UNIVERSAL-ASSEMBLED FIXTURES (UAF),
by N. Ye. Chernis. 16 May 61, 34p. incl. tables. (Trans. no. MCL-622 of Novoye v Teknologii Mashinostroyeniya 1:119-142, 1959)
Unclassified report

DESCRIPTORS: *Machine tools, *Industrial equipment, Industrial production, Production, Manufacturing methods, Machine tool industry, Costs, USSR.

Along with other systems of universal fittings, the system of universal-assembled fixtures (UAF) is of considerable interest to machine-building plants. In essence, the system of universal-assembled fixtures consists in assembling various fixtures by combining in different ways standardized, mutually interchangeable and wear-resistant parts from a previously prepared set. Upon completion of a given operation the assembled fixtures are broken down into their component parts, which can be repeatedly used when assembling other fixtures. (Author)

AD-259 242 Div. 26, 17
(11 July 61) OTS price $22.25

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
WELDING OF CHROME-NICKEL AUSTENITE STEELS (Svarka Khromonikelevykh Austenitnykh Staley).
by B. I. Medovar. 29 Mar 61, 420p. incl. illus. tables (Trans. no. MCL-458, pt. 1 of Mashgiz, 337p., 1958).

Unclassified report

DESCRIPTORS: *Welding, *Stainless steel, Steel, *Chromium alloys, *Nickel alloys, *Austenite, *Arc welding, Welding fluxes, Phase transitions, Chemical properties, Mechanical properties, Physical properties, Crystal structure, Heat treatment, Welds, Welded joints, USSR, Deformation, Fracture (Mechanics), Porosity, Alloys, Corrosion.

Properties of Cr-Ni Austenitic Steels: Chemical composition and application; Structure, physical, mechanical and corrosion properties. Characteristics of Metallurgical Processes During Welding of Cr-Ni Austentic Steels: Requirements for welded joints; Methods of alloying the weld metal; Features of metallurgical processes. The Structure of Welds in Cr-Ni Austenitic Steels: Primary and secondary crystallization; Effect of alloying admixtures and gases on the microstructure; Effect of working conditions and heat treatment on the structure of welds; Effect of long duration heating; Effect of plastic deformation and heating; Structure of the zone adjacent to the weld. Cracking and Porosity Occurring in the Welding of Austenitic Cr-Ni Steels: Classification of cracks; Mechanism of the ocurrence of hot (crystallization) cracks; Influence of the primary microstructure on the resistance of the weld metal to the formation of hot cracks; Influence of alloying admixtures and gases on the resistance to hot cracking; Metallurgical methods of preventing crystallization cracks.

AD-259 243 Div. 26, 14
(11 July 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
METAL BONDING TECHNIQUE (IN TWO PARTS).
20 Apr 61, 37p. incl. table 25 refs. (Trans. no. F-TS-9865 of Technica, Iss. 4 and 5: pp. 125-131, 191-197, 14 Feb 58).

Unclassified report

DESCRIPTORS: *Metal joints, *Bonding, *Resin adhesies, *Adhesives, *Resins, *Joints, Metals, Surfaces, Mechanical properties, Thermosetting resins, Hardening, Aging, Stability, Temperature, Adhesion, *Bonded joints, USSR, *Bibliography.

A discussion is presented on metal bonding techniques with emphasis on the use of resin adhesives. Topics included in the discussion are: (1) the bonding process, (2) bonding strength, (3) joint thickness, (4) hardening of synthetic resin binders, (5) the effect of the nature of the bonding surface, (6) the aged stability of synthetic resin binders, (7) heat resistance, (8) resistance to weather, heat, oil, solvents, and chemicals, (9) construction directives, and (10) application examples of synthetic resin binders. A 2-part bibliography in the field of bonding techniques is presented. The first part of the bibliography is an excerpt from a trade manual.

AD-259 261 Div. 26, 17
(11 July 61) OTS price $5.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
WELDING PRODUCTION (SECTION V, CHAPTERS I, III, AND V),
by V. A. Kislik, A. F. Troitskiy and others.
7 Feb 61, 59p. (Trans. no. MCL-807 of Metallovedeniye i Goryachaya Obrabotka Metallov, Moscow:pp. 316-319, 327-350, 363-370, 1959).

Unclassified report

DESCRIPTORS: *Welding, Cutting torches, Industrial production, Electric welding, Thermite, Electric arcs, Arc welding, Electric currents, Resistance, Electrodes, Industrial equipment, Welding rods, USSR, Welding fluxes, Slags, Welded joints, Welds, Arc welds, Spot welds, Automatic.

Welding Production: Classification and essence of the basic methods of welding and cutting; and Brief history of the development of modern methods of welding. Electric-Arc Welding: Principles of the basic methods and characteristics of the welding arc; Equipment; Processes of heating and fusing the basic and electrode metal (Transfer of the metal from the electrode to the part;) Welding low-carbon steels; Techniques of manual electric-arc welding; Technology of the preparation of the various kinds of welded joints; Automatic arc welding; Electroslag automatic welding; Semiautomatic welding under a layer of flux; Repair of rolling stock; and Secondary methods of arc welding. Contact Electrical Welding: Fundamentals of the process; Butt welding; Spot welding; Seam welding; Other methods of contact welding; and Machines for contact welding.

AD-259 285 Div. 26, 27, 9
(10 July 61) OTS price $5.60

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
DEVELOPMENT OF GAS-LUBRICATED BEARINGS FOR CLOSED-CYCLE GAS-TURBINE ROTORS.
Interim progress rept.
by M. W. Eusepi and D. D. Fuller. June 61, 48p. incl. illus. table (Rept. no. I-A2049-14). (Contract Nonr 234200, Proj. NR 061-113)

Unclassified report

DESCRIPTORS: *Lubrication, Bearings, Gases, *Gas bearings, Gas turbines, *Gas turbine rotors, Lubricants, *Thrust bearings, *Journal bearings, Pressure, Compressors, *Compressor rotors, Design, Mounting brackets, Gas flow, Vibration, Tests.

The development is reviewed of gas bearings for a closed-cycle gas-turbine rotor. Design and experimental data are given showing the problems involved in the application of these bearings. The journal bearings and the thrust bearing developed for the rotor are externally-pressurized without tilting pads. Each bearing surface is divided into three equal segments by appropriate grooving. Full loads were successfully carried by the bearings under non-rotational tests. The gas bearings operate at the same speed and with the same loads as the original oil-lubricated bearings and they fit into the space originally allocated to the oil bearings. (Author)

# Division 26 - PRODUCTION AND MANAGEMENT

AD-259 343 Div. 26
(11 July 61) OTS price $10.10

North American Aviation, Inc., Downey, Calif.
STUDY IN THE UTILIZATION OF HANDTOOLS IN SPACE,
31 Aug 60, 118p. incl. illus. 15 refs.
(Contract AF 33(616)6911, Proj. 8119)
(WADD TR 60-535) Unclassified report

DESCRIPTORS: Space flight, Effectiveness, *Maintenance tools, Space environmental conditions, Maintenance personnel, Training, Job analysis, *Maintenance.

Little data is known concerning the adequacy of earth tools as applied to forecasted maintenance and operations actions in the space complex. Such information is important because tasks will develop as man penetrates into space which will require the use of handtools. Theory envisions that extreme conditions will exist in space. Although exact conditions cannot as yet be defined for the space complex, certain broad parameters have been identified to guide the approach. A preliminary effort was therefore initiated to describe the utilization of tools in space. A major problem was identification of the anticipated tasks. Detailed data are provided on problems, career fields, questions of adequacy, individual tool analysis, and experimental investigations. (Author)

AD-259 417 Div. 26, 17
(13 July 61) OTS price $1.10

Army Arctic Test Board, Fort Greely, Alaska.
SERVICE TEST OF SET, WELDING, EQUIPMENT: FOR NONFERROUS METALS, USED WITH 300 - AMPERE WELDING MACHINES.
13 June 61, 5p.
(Proj. no. ATB 4-121)
Unclassified report

DESCRIPTORS: *Maintenance equipment, Tests, *Welding, Machines, Military equipment, Arc welding, Aluminum, Aluminum wire, Arctic regions, Electrodes.

Service tests were made to determine if the welding set is suitable for Army use under arctic winter conditions at organizational maintenance level for welding nonferrous metals. The welding set is designed to adapt standard 300-amp engine-driven arc welding machines for inert-gas, metal-arc welding. The test welder consists of an air-cooled hand gun with a self-contained wire drive and wire supply, a control monitor, a contactor, and an Ar gas regulator, all of which are interconnected. The test welder is designed for semi-automatic welding of Al with filler wires from 0.040- to 3/64-in. diam, and is rated for continuous duty at 200 amp. Tests included (1) pre-operational inspection and physical characteristics, (2) compatibility with related equipment, (3) welding operations (3/8 to 3-in.-thick Al alloy at 70 to -44F), (4) stowage and transportability, (5) maintenance, and (6) durability and reliability. On the basis of the tests, it was concluded that the welding set is suitable of Army use under arctic winter conditions at organizational maintenance level for welding nonferrous metals.

AD-259 546 Div. 26, 15
(13 July 61) OTS price $7.60

Applied Mathematics and Statistics Lab., Stanford U., Calif.
SOME ECONOMIC ASPECTS OF QUALITY CONTROL,
by Barnard E. Smith. 3 July 61, 71p. incl. illus. tables, 16 refs. (Technical rept. no. 53)
(Contract Nonr-225(3), Proj. NR 042-002)
Unclassified report

DESCRIPTORS: *Quality control, Probability, Economic conditions, Sampling, *Statistical analysis, Test methods.

Contents:
General formulation of the statistical decision problem
A decision theory model for sampling inspection
Solution to the model for sampling inspection
Efficiency of a sampling plan
Development of the input data
Evaluating the process curve
Determination of the cost parameters
Application of the decision theory model in industry

AD-259 573 Div. 26
(14 July 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
INVESTIGATING CAVITATION IN AN IMPELLER OF A CENTRIFUGAL PUMP,
by V. I. Dumov and M. A. Peshkin. 31 Mar 61, 11p. incl. illus. table. (Trans. no. MCL-885 of Teploenergetika 12:46-51, 1959)
Unclassified report

DESCRIPTORS: *Centrifugal pumps, *Cavitation, Impellers, Tests, Test methods, Pressure, Fluid flow, Pumps, USSR, Technological intelligence.

Results obtained in studying cavitation phenomena in an impeller of a centrifugal pump are analyzed, and recommendations are given for improving the anticavitation properties of pumps. It was concluded that: (1) the outer cavitational characteristics of a centrifugal pump cannot serve as a basis of determining the moment of origination of cavitation; (2) cavitation in a centrifugal pump may originate at pressures at the intake of the pump, exceeding by much the pressure, at which there is a noticeable drop in delivery and efficiency of the pump; and (3) a sharp drop in the delivery of a centrifugal pump takes place when cavitation envelopes the intake section of the intervane duct over the entire section. Cavitation in intervane ducts of a centrifugal pump impeller represents not an interrupted jet flow with specific separation boundary, but a flow with a multitude of moving caverns; and cavitational characteristics of centrifugal impellers can be improved considerably by enlarging in the planning projection the width of the initial section of the intervane duct. (Author)

AD-259 574 Div. 26
(14 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CENTRIFUGAL PUMP FOR AMALGAM,
by L. I. Gel'man. 27 Mar 61, 8p. incl. illus.
(Trans. no. MCL-884 of Energomashinostroyeniye 9:23-25, Sep 56)
Unclassified report

DESCRIPTORS: USSR, Technological intelligence, *Centrifugal pumps, *Mercury alloys, Test methods, Pumps, Shafts, Hydraulic seals, Mercury, Construction, Tests.

A description is given of a pump for the pumping of amalgam in which the principle of airtight shaft packing of original construction was employed. Data on testing shaft packing of this pump are given. The construction of shaft packing for a centrifugal pump was made for the purpose of eliminating contact between the amalgam and atmospheric air and a test was made to determine the efficiency of pump shaft packing. The obtained results were satisfactory. (Author)

AD-259 599 Div. 26, 30
(14 July 61) OTS price $6.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
SCIENTIFIC PRINCIPLES OF GROUP TECHNOLOGY,
by S. P. Mitrofanov. 21 Mar 61, 64p. incl. illus. tables (Trans. no. MCL-589 of Nauchnyye Osnovy Gruppovoy Tekhnologii, USSR, pp. 9-36, 1959)
Unclassified report

DESCRIPTORS: USSR, *Industrial research, Scientific research, *Machine shop practice, Machine tool industry, *Machine tools, Classification.

AD-259 611 Div. 26
(17 July 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
WAYS OF DECREASING THE WEIGHT AND DIMENSIONS OF POWER PRESSES,
by Yu. P. Kuz'ko, 18 May 61, 11p. incl. tables. (Trans. no. MCL-1060 of Kuznechno-Shtampovochnoye Proizvodstvo 8:18-21, 1959)
Unclassified report

DESCRIPTORS: Machines, *Industrial equipment, *Industrial production, *Forge presses, *Machine tools, Cutting tools, *Hydraulic presses, *Metal forming presses, Concrete, Steel, Metals, Processing, Production, Costs, USSR.

Technological aspects of high-power forging-pressing equipment for industry in the USSR are discussed. Use of such equipment allows for substantial lowering of metal expenditure, the reduction in cost of the finished product, and the improvement of mechanical properties of the base metal. The fifth five-year plan (1951-1955) called for an increase in the production of high-power forging-pressing equipment by eight fold. However, during this period only a 5.6 fold increase was accomplished. Cost and metal consumption in producing these units were primary obstacles in their production. High-power, small-dimensions presses of new structural design should result in reduction of production costs.

AD-259 957 Div. 26
(21 July 61) OTS price $6.60

General Electric Co., Schenectady, N. Y.
ON THE LOAD CAPACITY AND STABILITY OF ROTORS IN CYLINDRICAL GAS-DYNAMIC JOURNAL BEARINGS,
by B. Sternlicht and L. W. Winn. 3 July 61, 69p. incl. illus. tables.
(Contract Nonr-284400, Proj. NR 097-348)
Unclassified report

DESCRIPTORS: Bearings, *Journal bearings, *Gas bearings, Rotating structures, Stability, Load distribution, Theory, Tests, Rotor attitude indicators, Test equipment, Motion.

One of the most troublesome phenomena that is often exhibited with rotors operating in gas bearings is that of half frequency whirl instability. Eccentricity and attitude angle tests for steady load are described which were conducted to assure that good correlation between theory and experiment exists and that measurements are accurate. Initial disturbance and actual onset of half frequency whirl were measured for a variety of conditions. The effect of load, mass, L/D, and clearance on the threshold of instability was established and compared with theory. (Author)

AD-259 961 Div. 26, 8
(24 July 61) OTS price $1.60

Horizons, Inc., Cleveland, Ohio.
PILOT LINE PRODUCTION OF PASSIVE ELEMENTS BY CATHODOLYSIS.
Interim technical progress rept. 20 Mar-19 June 61,
by William J. Burkhard and Richard A. Fotland. July 61, 8p. incl. table.
(Contract AF 33(600)41705, Proj. 7-857)
(AMC TR 7-857, vol. 3) Unclassified report

DESCRIPTORS: *Dielectric films, *Dielectrics, *Metal films, Vapor plating, Vapors, Styrenes, Polymers, Acrylic resins, Gold, *Subminiature electronic equipment, Electronic equipment, *Capacitors, Cathodes, Manufacturing methods, *Resistors, Silicones, Tin compounds, Chlorides, Electron guns, Epoxy resins, Production.

Dielectric films have been formed in a vacuum system by the interaction of an electron beam with adsorbed vapors of styrene, Dow Corning 200 Silicone Fluid, methylmethacrylate, cyclopentadiene, and Epoxy 502 on glass slides. Tests indicate that the first three compounds can be used satisfactorily to make capacitors for ultraminiature circuits. Resistive elements have been formed in the same manner from tin tetrachloride vapor. Preparation of metallic films from other compounds has been unsuccessful due to oxide formation and diffusion pump fluid contamination. (Author)

AD-259 982 Div. 26, 14
(24 July 61) OTS price $1.10

Material Lab., New York Naval Shipyard, Brooklyn.
SPECIFICATION DEVELOPMENT OF THIN WALL NONRIGID POLYTETRAFLUOROETHYLENE ELECTRICAL INSULATING TUBING.
Final rept.,
by H. Pinski, 17 July 61, 5p. tables. (Lab. proj. no. 4861-R-45)
Unclassified report

DESCRIPTORS: *Plastic tubing, *Electric insulation, Insulating materials, Electrical equipment, Ethylenes, Fluorides, Polymers, Plastics, Specifications, Test methods, Mechanical properties, Dielectric properties, Physical properties.

An investigation was conducted to compare characteristics of thin wall nonrigid polytetrafluoroethylene tubing with those of standard wall tubing. Materials from several manufacturers were

tested. New methods were investigated to determine whether they would be useful in distinguishing quality tubing and be included in a revised specification of MIL-I-22129B. These methods included stress elongation, penetration, and specific gravity measurements. It was recommended that sizes No. 26 through 30 be listed under thin wall tubing only and be dropped from the standard wall category; that some of the listed characteristics with specification limits be considered for inclusion under MIL-I-22129B; and that for all sizes, stress at 150% be measured. Stress limitations for various sizes are also proposed.

## 27. PROPULSION SYSTEMS

AD-259 086 Div. 27, 10
(6 July 61) OTS price $5.60

Parker Aircraft Co., Los Angeles, Calif.
DESIGN, DEVELOPMENT, AND TESTING OF A LIQUID HYDROGEN TANK VENT AND RELIEF VALVE,
by A. E. Neal and R. H. Warren. Dec 60, 143p. incl. illus. 10 refs. (Rept. no. S6OR1616)
(Contract AF 33(616)6710, Proj. 6753)
(AFFTC TR 60-71) Unclassified report

DESCRIPTORS: *Valves, *Propellant tanks, Liquid rocket propellants, Rocket propulsion, Design, Tests, Liquefied gases, Hydrogen, Control valves, Helium, Gas valves, Gas leaks, Gas seals, Low temperature research, Materials, Reliability, *Safety valves.

A summary is presented of the design and development of a liquid H propellant tank vent and relief valve for use in rocket propulsion systems, missiles, and space vehicles. A study was made of the physical properties of liquid H and the properties of materials at liquid H temperatures. Materials were chosen to ensure the reliability, minimum weight, and low leakage of this component. The validity of the valve concept as a pressure control device was well established A valve was developed with a high degree of steady state accuracy, adequate response characteristics, and consistent crack and reseat characteristics within the specified operating temperature range. An adequate and simple means of thermal compensation of an absolute pressure reference device was developed. Satisfactory operation at -420 F of a valve seat with low seating force and of mylar diaphragms was demonstrated. (Author)

AD-259 087 Div. 27, 12
(6 July 61) OTS price $9.60

Parker Aircraft Co., Los Angeles, Calif.
DESIGN, DEVELOPMENT, AND TESTING OF A LIQUID HYDROGEN SHUTOFF VALVE,
by P. R. Hughes and R. L. Baisley. Dec 60, 113p. incl. illus. tables (Rept. no. S6OR1617)
(Contract AF 33(616)6710, Proj. 6753)
(AFFTC TR 60-72) Unclassified report

DESCRIPTORS: *Guided missiles, *Spaceships, *Satellite vehicles, *Liquefied gases, *Hydrogen, *Rocket propulsion, Physical properties, *Valves, *Cut-off valves, Design, Tests, Reliability.

Research concerns the development of a liquid hydrogen shutoff valve for use in a rocket propulsion system of a missile or space vehicle. A study was made of the physical properties of liquid hydrogen and the properties of materials at liquid hydrogen temperatures. The prime design objectives for this component were reliability of operation, minimum weight, and low leakage. The validity of the valve concept as a liquid hydrogen shutoff device was well established by development testing of the elements of the final unit. The program has resulted in a valve design with essentially zero leakage at the specified operating temperatures. The valve seat configuration that produced this result was a spherically lapped metal poppet and seat with relatively high unit seat loading. Satisfactory operation of a hydraulically formed bellows for use as a high pressure actuator was demonstrated. Development testing of components was accomplished with liquid hydrogen. Relatively simple and economical test equipment was used. This was adequate for conducting small scale tests with liquid hydrogen. (Author)

AD-259 259 Div. 27, 9
(11 July 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
STUDY OF HEAT TRANSFER IN A DEAD-END CHANNEL UNDER FREE CONVECTION CONDITIONS,
by A. G. Romanov. 1 May 61, 29p. incl. illus. (Trans. no. MCL-832 of Izvestiya Akademii Nauk SSSR - Otdeleniye Tekhnicheskikh Nauk 6:63-76, 1956).
Unclassified report

DESCRIPTORS: *Heat transfer, USSR, Technological intelligence, *Fluid flow, Differential equations, *Gas turbines, Cooling, Gas turbine blades, Mathematical analysis, Tests, Boundary layer, Integral equations, Hydrodynamics.

Results of theoretical and experimental research on the effect of flow and heat exchange in a dead-end channel, which is present in the field of activity of centrifugal forces, are given. Theoretical equations were obtained by 2 methods: (1) on the basis of analysis of the system of differential equations which describes the effect of heat transfer by the method of the theory of similitude and dimension; and (2) on the basis of solution of the integral equations of a boundary layer. A test check-up was made on 2 stationary and 1 rotating model. Equations for heat transfer between the wall and the fluid in a dead-end channel during luminous and turbulent kinds of fluid flow, were recommended as a result of the test. (Author)

AD-259 307 Div. 27, 12, 14
(11 July 61) OTS price $1.60

High Temperature Materials, Inc., Boston, Mass.
PYROLYTIC CARBIDE DEVELOPMENT PROGRAM.
Monthly progress rept. no. 14, 1-31 May 61. 31 May 61, 7p. incl. table.
(Contract NOw 60-0292)
Unclassified report

DESCRIPTORS: *Guided missiles, Underwater to surface, *Rocket motor nozzles, Tantalum compounds, Carbides, *Refractory materials, Pyrolysis, Coatings, Niobium compounds, Hafnium compounds, Solid rocket propellants, Refractory coatings, Processing, Hardness, Surface to surface.

Investigations were continued on the development of pyrolytic carbides specifically for application to Polaris nozzles for use with advanced propellants. Two symmetric Polaris nozzles were coated with tantalum carbide. Process parameters were investigated to determine optimum coating conditions and injector design changes were made to improve the quality of the carbide produced. Niobium carbide and tantalum carbide coated nozzles are described. Additional data for pyrolytic niobium carbide and hafnium carbide is also presented. (Author)

AD-259 432 Div. 27, 9, 25
(14 July 61) OTS price $13.50

Applied Physics Lab., Johns Hopkins U., Silver Spring, Md.
THERMODYNAMICS OF RAMJET FLOW PROCESSES.
Rept. on Ramjet Technology.
by F. Bader and E. A. Bunt. Feb 60, 175p. incl. illus., 35 refs. (Rept. no. TG 370-2)
(Contract NOrd-7386)
Unclassified report

DESCRIPTORS: *Ramjet engines, Supersonics, *Thermodynamics, Aerodynamics, Mathematical analysis, Design, Gas flow, Shock waves, Thrust, Drag, Nozzles, Ramjet engine nozzles, Combustion, Jets, Diffusers, Specific impulse, Combustion chambers, Differential equations, Integral equations, Supersonic diffusers.

A brief and nonrigorous development of useful gas flow relationship is presented. The flow is considered from the one-dimensional aspect; however, relevant flow phenomena that do not fall into the one-dimensional category are considered. In general the treatment is for nonviscous flow; however, nozzle boundary layer effects are considered. Next the theory is applied to illustrate the functioning of a ramjet as a heat engine. The design and detail functioning of the diffuser, combustor, and exit nozzle and how these are affected by flight environmental conditions and the requirements of thrust and power output are considered. How the basic thermodynamic calculations of a ramjet engine are made is shown. Various engine arrangements are considered, and from there the one having the best figure of merit is picked.

AD-259 441 Div. 27, 26, 17
(14 July 61) OTS price $1.10

Rolla Metallurgy Research Center, Bureau of Mines, Mo.
VAPOR DEPOSITION OF TUNGSTEN ON ROCKET NOZZLE INSERTS.
Monthly progress rept. no. 14 for June 61,
by F. W. Hoertel. June 61, 3p.
Unclassified report

DESCRIPTORS: *Rocket motor nozzles, *Vapor plating, *Metal coatings, Metallic smoke deposits, *Beryllium compounds, Oxides, *Tungsten, Fracture (Mechanics), Corrosion, Refractory materials, Manufacturing methods, Nozzles, Fluorides.

A second beryllia nozzle insert was coated with tungsten. The deposited metal was rough and lacked uniformity. This condition was owing, in part, to difficulty in controlling a slow flow rate of heavy-density tungsten hexachloride vapor. The tungsten-coated beryllia substrate had a transverse crack. Beryllia exposed to reactant gases showed some corrosion. (Author)

AD-259 485 Div. 27, 12, 14
(17 July 61) OTS price $1.10

Kidde, Walter, and Co., Inc., Belleville, N. J.
FIBERGLASS MOTOR CASE STUDY-POLARIS SECOND STAGE END CLOSURE.
Progress rept. 1 June-1 July 61,
by T. Siuta. 5 July 61, 7p. incl. illus. (Rept. no. 3642-3)
(Contract NOw 61-0497-c)
Unclassified report

DESCRIPTORS: Guided missiles, Surface to surface, *Rocket cases, *Glass textiles, *Rocket motors, *Filament-wound construction, Design, Stresses, Hydrostatic pressure, Deflection, Aerodynamic configurations, Pressure, Tests, Staging, Underwater to surface, Solid rocket propellants.

Progress was reported in resolving the problem involving the selection of an optimum winding pattern for the fiberglass motor case dome closures. It has been established that in any dome configuration the winding pattern and contour must be mutually compatible to minimize bending and inflection points. Furthermore, the contour must be such that subsequent deflections during hydrostatic loading will not effect the original shape to the point where serious bending and inflection points are encountered. With this in mind, a concerted effort was made to determine the significant parameters effecting these contours and the magnitude of these effects. (Author)

AD-259 498 Div. 27
(14 July 61) OTS price $4.00

National Aeronautics and Space Administration, Washington, D. C.
CONTROL OF GAS-TURBINE AND RAMJET ENGINES,
by L. A. Zalmanzon and B. A. Cherkasov. July 61, 259p. incl. illus. tables, 148 refs. (Technical trans. no. F-41; Trans. of publication by the Government Defense Industry Press, Moscow, 1956)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA technical trans. F-41.

DESCRIPTORS: *Turbojet engines, *Ramjet engines, Control systems, Design, USSR, Technological intelligence, Fuel systems, Jet planes, Mathematical analysis, Differential equations, Stability, Transients, Synthesis, Turbojet exhaust nozzles, Jet engine fuels.

This book deals with the principles of control of aviation gas turbine and ramjet engines. Attention is concentrated on describing the physical bases of the processes of engine control and an exposition of the methods of experimental study and design of control apparatus. A series of examples bring out the close connection between the operation of the elements in the control loop and the fuel supply system of the engines. The characteristics of the several elements of the fuel apparatus are given. The book is written as a textbook for students in Aviation Institutes, but may also be useful for workers specializing in the field of aviation engines. (Author)

AD-259 555 Div. 27
(13 July 61) OTS price $4.60

Rand Corp., Santa Monica, Calif.
MINIMUM-WEIGHT PROPORTIONS OF PRESSURE-VESSEL

# Division 27 - PROPULSION SYSTEMS

HEADS,
by G. A. Hoffman. 13 June 61, 39p. incl. illus.
(Research memo. no. RM-2675)
(Contract AF 49(638)700, Proj. RAND)
Unclassified report

DESCRIPTORS: *Pressure vessels, Design, Configuration, Cylindrical bodies, Stresses, Shear stresses, Thickness, Pressure, Mathematical analysis, *Structural shells, Pressure tanks, *Propellant tanks, Fuel tanks.

Minimum-weight shapes of head closures for cylindrical pressure vessels are derived. Head configurations, weights, and membrane stresses are derived for thin-shell heads of isotropic materials with uniform internal pressure by restricting the knuckle shear stresses to constant values and/or by minimizing the weight of prescribed-shape heads. Torispherical, ellipsoidal, and constant-shear-stress heads with constant and varying thickness are investigated, with constancy of enclosed volume and supporting structure being considered. This study resulted in certain highly efficient shapes weighing up to 11% less than the corresponding hemispherical capping closure. (Author)

AD-259 577 Div. 27, 25, 12
(14 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE FIRST POLISH EXPERIMENTAL PLASMA ROCKET ENGINE,
by Andrezj Trepka. 12 May 61, 7p. incl. illus.
(Trans. no. MCL-873 of Skrzydlata Polska 31 (1473), p. 5, 31 July 60)
Unclassified report

DESCRIPTORS: Poland, Technological intelligence, *Plasma physics, Gas ionization, Magnetohydrodynamics, *Rocket motors, Astronautics, Argon, Hydrogen, Gas discharges, Exhaust nozzles, *Ion rockets.

Results of an interview with Prof. Zbigniew Paczkowski, Dean of Applied Mechanics Dept., Warsaw Polytechnicum are presented. Questions were answered about Poland's first experimental plasma rocket engine, the nature of plasma, the development of plasma burners, the operation of plasma engines, and the place of plasma engines in space conquest.

AD-259 590 Div. 27
(14 July 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
INVESTIGATING THE TEMPERATURE FIELD OF A COOLED STEAM TURBINE ROTOR (Issledovaniye Temperaturnogo Polya Okhlazhdayemogo Rotora Parovoy Turbiny),
by Ye. I. Bublikov and V. M. Kapinos. 8 Mar 61, 15p. incl. illus. tables (Trans. no. MCL-835 of Energomashinostroyeniye 4:8-12, 1960)
Unclassified report

DESCRIPTORS: *Steam turbine rotors, Cooling, Design, Heat transfer, Analysis, Steam, Power plants, Steam power plants, USSR.

AD-259 591 Div. 27
(14 July 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
DISTRIBUTION OF TEMPERATURE IN THE SHANK COUPLING SECTION OF WORKING BLADES OF A COOLED ROTOR (Raspredeleniye Temperatury Na Uchastke Khvostovogo Soyedineniya Rabochikh Lopatok Okhlazhdayemogo Rotora),
by V. M. Kapinos. 9 Mar 61, 18p. incl. illus.
(Trans. no. MCL-833 of Izvestiya Vysshikh Uchebnykh Zavedeniy, Energetika 1:78-88, 1960)
Unclassified report

DESCRIPTORS: *Steam turbine rotors, Steam turbine blades, *Gas turbine rotors, *Cooling, Gas turbine blades, Heat transfer, Design, Mathematical analysis, Thermal conductivity, Differential equations, USSR.

AD-259 849 Div. 27, 14
(20 July 61) OTS price $8.10

Union Carbide Research Inst., Tarrytown, N. Y.
RESEARCH IN PHYSICAL AND CHEMICAL PRINCIPLES AFFECTING HIGH TEMPERATURE MATERIALS FOR ROCKET NOZZLES.
Semiannual progress rept., 1 Jan-30 June 61.
by Robert Lowrie. 30 June 61, 86p. incl. illus. tables, 34 refs.
(Contract DA 30-069-ORD-2787; In cooperation with Parma Research Center, Cleveland, Ohio)
Unclassified report

DESCRIPTORS: *Rocket motor nozzles, *Refractory materials, Carbides, Borides, Nitrides, Silicides, Carbon, Graphite, Mechanical properties, Oxides, Cerium compounds, Vaporization, Spectrographic analysis, Thermodynamics, Thermal conductivity, Gases, Chemical reactions, High temperature research, Silicon, Reaction kinetics, Solids, Resistance, Uranium compounds, Materials.

Heats of vaporization and formation of TiB2 and the Al from AlN were measured by mass spectroscopy. An evaporation coefficient of 0.8 to 1.0 was obtained for (110) and (111) planes of Si. Absorption spectra revealed a strong doublet, apparently caused by a C3 molecule, in the matrices of C vapor in Ar. Vibration frequency studies of B2O3 are reported. Up to 2200 C there was essentially no reaction of molecular N with graphite. Above 1350 C atomic N reacts with graphite to form cyanogen. The reaction of H with graphite was studied under static and kinetic conditions. Thermal conductivities of graphite foams were measured. Mechanical properties of MgO single crystals and polycrystalline W were investigated. Powders of refractory compounds were significantly purified by vacuum heating up to 2000 C.

AD-259 977 Div. 27, 26, 17, 12
(21 July 61) OTS price $1.60

Lyon, Inc., Detroit, Mich.
DEVELOPMENT OF DEEP DRAWN - ONE PIECE HIGH PERFORMANCE ROCKET MOTOR CASE.
General Rept. no. 6, 1 Aug 60-10 Apr 61.
10 Apr 61, 17p. incl. illus.
(Contract DA 20-018-ORD-23004)
Unclassified report

DESCRIPTORS: *Rocket cases, Rocket motors, Solid rocket propellants, *Steel, Manufacturing methods, Drawing (Machine processing), Heat treatment, Titanium alloys.

Progress is reported on the operational part drawings and special tooling drawings for the production of the 40-in.-diam monolithic rocket motor cases. Consideration is being given to a new Ni-Fe alloy as the second alloy steel. Preliminary studies are being made on both a 20% Ni- and a 25% Ni-Fe alloy as well as an all beta Ti alloy. Strain hardening data are presented for these 3 alloys and the Tricent 300-M steel. The 20 Tricent 300-M forged billets were hot pancaked into round flat blanks (with a formed igniter boss) containing radial flow lines in preparation for deep drawing and forming.

AD-259 980 Div. 27, 17, 26, 12
(24 July 61) OTS price $1.60

Mellon Inst. of Industrial Research, Pittsburgh, Pa.
THE EVOLUTION OF ULTRA-HIGH STRENGTH STEELS, AND RESEARCH ON MATERIALS AND VARIOUS NOVEL TECHNIQUES OF FABRICATION OF HIGH PERFORMANCE ROCKET MOTOR CASES,.
Progress rept. no. 38, 1-30 June 61,
by G. K. Bhat. 30 June 61, 14p. incl. illus. tables (Proj. 381-3)
(Contract NOrd-18169)
Unclassified report

DESCRIPTORS: Steel, *Rocket cases, Rocket motors, Materials, Aluminum alloys, Aluminum wire, Wire, Beryllium, Processing, Manufacturing methods, Drawing (Machine processing), Melting, Casting, Filament wound construction, Epoxy resins, Tensile properties, Welding, Arc welding, Welded joints, Welds, Ultrasonics, Mechanical properties, Tests.

Tensile property data are presented for 3 Al alloy wires. Consideration is being given to the construction of test chambers by winding Al filaments and bonding with epoxy resins since the possibility exists for producing a chamber with a strength-to-density ratio in excess of 1 million. The length of Be filaments which could be drawn was limited, and the presence of a thin BeO coating presented a hazard. Preliminary data indicated that vacuum melted and cast steel, especially the double consumable arc remelted material, had improved fatigue endurance characteristics. Tensile test data are presented on welded and unwelded samples of air melted MX-2. Progress is reported in weld grain refinement by the application of ultrasonic excitation. The effect of surface decarburization on the biaxial strength of small pressure containers of Rocoloy 270, 300 M, and AISI 4340 was also studied.

## 28. PSYCHOLOGY AND HUMAN ENGINEERING

AD-259 187 Div. 28
(17 July 61) OTS price $6.60

Massachusetts U., Amherst.
TRAINING ASPECTS OF DECISION MAKING,
by Warren H. Teichner and Jerome L. Myers.
Mar 61, 59p. incl. illus. tables.
(Contract N61339-588)
(Technical rept. no. NAVTRADEVCEN 588-1)
Unclassified report

DESCRIPTORS: *Training, *Reasoning, Probability, *Perception.

The purpose of this investigation was to examine various elements that make up the entire decision-making process in order to determine which elements may be improved most by training and which are most critical to successful decision-making performance. The report consists of five experiments, each dealing with different problems of the decision-making process. In general these experiments are concerned with three major problem areas: (1) perceptual problems involved in displaying decision-making information, (2) subjective probability, and (3) the evaluation of available human decision-making models. (Author)

AD-259 364 Div. 28
(11 July 61) OTS price $5.60

Rochester U., N. Y.
OVERLAN AS A PREDICTOR OF FORM DISCRIMINATION UNDER SUPRATHRESHOLD CONDITIONS,
by Robert M. Boynton, Charles L. Elworth and others. June 61, 53p. incl. illus. tables.
(Contract AF 30(602)1973, Proj. 8501)
(RADC TR 61-99) Unclassified report

DESCRIPTORS: *Vision, Psychology, Physiology, *Reaction time, Stimulation, Measurement, Mathematical analysis, Visual acuity, Visual threshold, Effectiveness, *Applied psychology, Time.

The purpose of this study is to investigate the relation between physical overlap and the discrimination of forms under suprathreshold conditions of viewing. The experiments reported include: determinations of reaction time required for correct discrimination of nonsense forms, similar determinations for the correct discrimination of ellipses, and an investigation of the influence of area on the discrimination of nonsense forms. An additional experimental procedure is introduced to ascertain whether overlap is a predictor of judged similarity. Computations are reported which relate the overlap hypothesis to search-recognition data for rectilinear form classes. Physical measures of overlap are positive in relation to performance measures in all cases. However, it is clear from the results of these experiments that form discrimination also involves factors other than overlap. (Author)

AD-259 505 Div. 28
(13 July 61) OTS price $4.60

Illinois U., Urbana.
THE CONTRIBUTION OF PART-TASK TRAINING TO THE RELEARNING OF A FLIGHT MANEUVER,
by Lyle E. Hufford and Jack A. Adams. 22 Mar 61, 44p. incl. illus. tables.
(Contract N61339-297)
(NAVTRADEVCEN 297-2) Unclassified report

DESCRIPTORS: *Training, *Learning, Flight testing, Effectiveness, Flight simulators.

The purpose of this study was to determine the contribution of part-task training to the relearning of a whole-task. An experiment was performed using subjects who had learned the whole-task (a simulated bomb-toss maneuver) during participation in the previous study, Part-Versus

Whole-Task Learning of a Flight Maneuver, TR NAVTRADEVCEN 297-1 but had lost proficiency as a result of a ten-month interval of non-practice. Half the subjects obtained part-task refresher training prior to whole-task training; the other half obtained whole-task training only. Results revealed that while part-task training could not completely substitute for whole-task training, it substantially reduced the number of whole-task trials needed. (Author)

AD-259 526 Div. 28, 15
(14 July 61) OTS price $10.10

Educational Testing Service, Princeton, N. J.
HUMAN MEMORY. A PARTIAL MODEL AND ITS IMPLICATIONS FOR RETROACTIVE PHENOMENA.
Doctoral thesis (Technical rept. on Mathematical Techniques in Psychology).
by John Ross. May 61, 118p. incl. illus. tables, 103 refs.
(Contract Nonr-185815, Proj. NR 150-088)
Unclassified report

DESCRIPTORS: *Memory, Training, *Mathematical prediction, Theory, Psychiatry, Computers, Learning, Training, Stimulation, *Psychology, *Behavior, Errors, Speech, Conditioned reflexes, Vision, Psychoses.

After a consideration of experimental and other evidence, about the functioning of human memory, four features were selected as most salient, and a model proposed to account for them. The model is based upon certain concepts borrowed from the computer field and a consideration of information transmission and storage. It is meant to make psychological sense and, at the same time, to be realizable in a computer for a study of its properties. The model led to deductions about phenomena of retroaction, and four experiments were conducted to test the deductions. The first experiment involved colored geometrical forms and studied the differential effects of interpolated conditions of low and high correlation between color and form. The second experiment studied the differential effects of variation in a structure of linkages between figures and names on the recall of an ambiguously structured similar situation. The third experiment studied the types of errors caused in the recall of a list of word paired associates by two lists varying in the meaningfulness of the stimulus-response pairings. The fourth experiment studied the effects of training procedures on the recall of doubly structured number matrices, and the differential effects of interpolated tasks, depending upon training procedures. (Author)

AD-259 527 Div. 28, 15
(14 July 61) OTS price $7.60

Educational Testing Service, Princeton, N. J.
EMOTIONAL COMPONENTS OF EARLY RECOLLECTIONS.
Doctoral thesis, (Technical rept. on Mathematical Techniques in Psychology).
by Robert E. McCarter. May 61, 68p. incl. illus. tables.
(Contract Nonr-185815, Proj. NR 150-088)
Unclassified report

DESCRIPTORS: *Emotions, *Factor analysis, *Psychiatry, *Memory, Theory, Statistical analysis.

This study was designed to determine the components of emotion and to correlate the emotional components of early recollections with psychiatric diagnosis. Eighty recalled affects were rated by 415 college students. Intercorrelation of the ratings generated an 80 x 80 correlation matrix. A factor analysis of the matrix yielded four bipolar orthogonal factors: pleasantness-unpleasantness, arousal-indifference, acceptance-rejection, and comprehension-puzzlement. The factor structure supported the activation theory of emotion. The subjects of the second experiment were 40 sociopaths, 16 alcoholics, 10 organics, 13 paranoid schizophrenics, and 23 normals. They rated the emotion in their own early recollections on scales derived from the four above-mentioned primary emotional factors. A discriminant analysis distributed the groups along two axes, designated C and D. Axis C separated organics and paranoid schizophrenics from each other and from the other three groups. Axis D separated the normals from the clinical groups. To assist in the identification of C and D, scores on the 80 affect rating scales were estimated for the centroid of each experimental group. Axis C was then identified as sociophobia-sociophilia, and axis D as comprehension. The emotional components of the early recollections of the paranoid schizophrenics indicated strong sociophobia. The organics' early recollections indicated high sociophilia. A feeling of comprehension characterized the early recollections of the normals. (Author)

AD-259 620 Div. 28, 16
(17 July 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
NEW EXPERIMENTAL STUDIES ON THE NATURE OF HYPNOTIC SUGGESTIONS AND THEIR EFFECT ON ORGANIC FUNCTIONS.
by K. Schmitz. 19 May 61, 25p. (Trans. no. MCL-933 of Munchener Medizinische Wochenschrift 99:pp-1323-1326 and 1362-1365, 1957)
Unclassified report

DESCRIPTORS: *Sleep, *Reaction (Psychology), *Psychiatry, Psychoneuroses, Experimental data, Brain, *Anesthesia, *Conditioned reflex, Reasoning, Physiology, Stimulation.

AD-259 621 Div. 28, 16
(17 July 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE INFLUENCE OF HYPNOSIS ON TEMPERATURE SENSATION AND HEAT CONTROL.
by August Wilhelm von Eiff. 19 June 61, 19p. incl. tables (Trans. no. MCL-931 of Zeitschrift f. d. Gesamte Experimentelle Medizin 117:261-273, 1951)
Unclassified report

DESCRIPTORS: *Reaction (Psychology), Temperature, Heat, *Stimulation, Skin, Oxygen consumption, Emotions, Spasms, Muscles, *Stress (Psychology), Respiration, Stress (Physiology), *Body temperature, Theory, *Psychiatry, Psychoneuroses, *Sleep.

AD-259 628 Div. 28, 16
(17 July 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ELECTROPHYSICAL RESEARCH OF CONDITIONED AND UNCONDITIONED REFLEXES IN DIFFERENT PHASES OF HYPNOSIS IN A PERSON,
by A. I. Mareninа. 12 May 61, 6p. incl. illus. 10 refs. (Trans. no. MCL-919 of Akademii Nauk SSSR, Trudy Instituta Fiziologii 8:77-80, 1959)
Unclassified report

DESCRIPTORS: *Conditioned reflex, Electroencephalography, Brain, Stimulation, *Sleep, *Reaction (Psychology), *Psychiatry, Psychoneuroses.

AD-259 713 Div. 28
(18 July 61) OTS price $1.60

California U., Los Angeles.
MOTIVATION AND THE DIRECTION OF THINKING.
Technical rept. no. 8 on The Training of Original Problem Solving Behavior,
by Irving Maltzman. July 61, 18p. 49 refs.
(Contract Nonr-23350)
Unclassified report

Paper presented at Western Psychological Association Convention June 61 in Symposium on Motivation and Thinking.

DESCRIPTORS: *Reasoning, Analysis, *Learning, *Behavior.

Problems of thinking may be made more amenable to experimental and theoretical analysis if thinking is assumed to be a complex form of behavior involving changes within and between classes of responses occurring on the basis of principles derived from simpler experimental situations. The most extensive development of experimentally grounded motivational concepts is undoubtedly the S-R behavior theory formulations. Motivational concepts may be classified as either associative or nonassociative in nature in terms of their effects upon behavior. Effective rive state in its energizing role is the princip l nonassociative variable. It represents the summation of needs present at the moment, including the frustration induced drive of the anticipatory goal response. Other motivational variables are wholly or in part associative in nature. The drive stimulus is an associative variable. Another distinction among motivational concepts of particular importance in relation to thinking is between process and state variables.

AD-259 740 Div. 28
(18 July 61) OTS price $4.60

Washington U., Seattle.
THE STATEWIDE TESTING PROGRAM,
by Paul Horst. June 61, 43p.
(Contract Nonr-47708)
Unclassified report

Presented at the Measurement Seminar, Field Service Center, Dept. of Education, University of California, Berkeley, June 5, 1961.

DESCRIPTORS: *Psychometrics, Achievement tests, Aptitude tests, Personality tests, Measurement, Vocational tests, Effectiveness, Education.

Contents:
Testing programs in general
Requirements of a good testing program: Functional requirements; Administrative requirements; Interpretation facilities; and Technical requirements
National testing programs: The American college testing program; The college entrance examination board tests; The psychological corporation
Advantages of statewide testing programs: Development of adequate counseling and advisory systems; Advantages due to single test battery; Adequate processing facilities
Difficulties in setting up state testing programs: Emotional difficulties; Administrative difficulties; Technical difficulties
The variables of differential prediction: The criterion variable; Predictor variables
Methodological and technological problems: The incomplete data matrix; Predictor selection; Criterion summarization; Predicting predictors; Criterion grouping; Transformation of high school and college grades; Optimal classification

AD-259 844 Div. 28, 23
(24 July 61) OTS price $4.60

Army Library, Washington, D. C.
THE EXECUTIVE: PHILOSOPHY, PROBLEMS, AND PRACTICES. A BIBLIOGRAPHY,
comp. by Harry Moskowitz and Jack Roberts. 1961, 39p. 222 refs.
(In cooperation with Air Force Reserve Officers Training Corps, Air University)
Unclassified report

DESCRIPTORS: *Bibliography, *Leadership, *Management engineering, Training.

AD-259 992 Div. 28
(24 July 61) OTS price $9.60

Psychological Research Associates, Arlington, Va.
PSYCHOLOGICAL STUDY OF DECISION MAKING,
by Paul C. Berry. 14 Mar 61, 110p. incl. illus. tables, 29 refs.
(Contract N61339-797)
(Technical rept. NAVTRADEVCEN 797-1)
Unclassified report

DESCRIPTORS: Training, *Training devices, Tests, *Reasoning, Officer personnel, Theory, *Psychometrics, Behavior, Perception.

In order to provide a basis for the development of training materials for those decision-making tasks which may frequently face naval officers, a situational test was developed involving simulation of some of the duties of the Squadron Duty Officer of a naval air squadron. The test was used with 20 officers. Results of this preliminary study indicated that ratings of the intermediate steps in the process by which decision was reached could be made reliably, and the comparison of methods apparently used by the officers with those that seemed desirable on theoretical grounds suggested several topics that should be included in the development of training materials. (Author)

# Division 29 - QUARTERMASTER EQUIPMENT AND SUPPLIES

## 29. QUARTERMASTER EQUIPMENT AND SUPPLIES

AD-259 097 Div. 29, 16
(5 July 61) OTS price $1.10

Springfield Coll., Mass.
ENERGY COST AND COMFORT OF WALKING IN THE DIRECT MOLDED SOLE BOOT WITH ANTI-PERSONNEL MINE SHANK, by Philip D. Gollnick, Peter V. Karpovich, and Sharpe James. 28 June 61, 5p. table.
(Contract DA 49-007-md-889)

Unclassified report

DESCRIPTORS: *Shoes, Materials, Aluminum, Leather, Steel, Oxygen consumption, Metabolism, Calorimeters, Measurement, Tests, Fatigue (Physiology), Body weight, Safety, Metals.

The energy cost and comfort of walking in two types of footgear were investigated. The footgear were the direct molded sole leather combat boot incorporating solid case aluminum wedge shape shank (to simulate hollow stainless steel shank designed for protection against antipersonnel mines) and the conventional Good Year welt leather combat boot, incorporating regular flat steel spring shank. Six male subjects walked at speeds of 2.0, 2.5, and 3.0 m.p.h. at grades of 0, 4, 8, and 10 degrees. Each subject was tested twice in each type of footgear at each speed-grade combination. Altogether 288 tests were made. Gross energy cost was calculated from oxygen consumption (closed circuit method) and expressed in gm.cal./kg./min. Comfort or discomfort was evaluated by the subjects. There was no statistically significant difference in energy cost of walking in the anti-mine and conventional combat boots. Subjects unanimously reported that the anti-mine boots were more comfortable than the conventional ones. This was mainly because the former could be fitted better by lacing, while the same could not be achieved in conventional boots which had straps and buckles. (Author)

AD-259 320 Div. 29
(10 July 61) OTS price $6.60

Marine Corps Equipment Board, Quantico, Va.
TEST OF BOOT, SERVICE, COMBAT.
Final rept.
26 June 61, 81p. incl. illus. tables (Proj. no. 42-58-01H)

Unclassified report

DESCRIPTORS: *Shoes, Military requirements, Tests.

A troop test was conducted on four types of combat boots to determine which of the four would be most suitable for Marine Corps use. The boots tested were the standard Army boot; standard Marine Corps boot; Army boot built on the Ft. Knox V last; and the Marine Corps boot built on the Ft. Knox V last. The performance of all four types of boot was satisfactory, but the two types built on the Ft. Knox V last were superior. Concerning construction characteristics, the Marine Corps boot characteristics of flesh (rough) side of the upper leather outside and closure with a combination of hooks and eyelets was considered the most suitable for Marine Corps use. It is recommended that a combat boot with Marine Corps boot characteristics, built on the Ft. Knox V last, with minor modifications as described in this report, be adopted for Marine Corps use. (Author)

AD-259 415 Div. 29
(13 July 61) OTS price $1.10

Army Arctic Test Board, Fort Greely, Alaska.
SERVICE TEST OF ALL-PURPOSE SKIS,
10 June 61, 6p.
(Proj. no. ATB 3-251)

Unclassified report

DESCRIPTORS: *Skis, Design, Tests, Effectiveness.

Research was undertaken to determine the suitability of the seven-foot cross-country ski with added metal edges as an all-purpose military ski for Army use. The test all-purpose skis with metal edges are standard military cross-country skis, seven-feet long, of medium flexibility drawn from depot stock and modified by the application of steel edges. The type tip section on the test ski was found to influence performance during cross-country operations. In all cases the flexibility of the thin tip section provided in the Paris ski was more desirable than the Lamteck ski. Shovel type tip of the Lamteck ski were exhibiting better flotation and tendence to dive in loose snow than did the Paris ski. Closer production tolerances were suggested if a uniform all-purpose ski is to be provided. Skis provided for test were standard cross-country withdrawn from depot stock and modified by the addition of metal edges. Dry rot was detected in some of the test skis. The all-purpose ski was considered suitable for Army use.

# 30. RESEARCH AND RESEARCH EQUIPMENT

AD-259 067 Div. 30, 5
(6 July 61) OTS price $7.60

Navy Underwater Sound Lab., Fort Trumbull, New London, Conn.
TECHNICAL SPECIFICATIONS OF THE MAGNETIC RECORDING SYSTEMS AVAILABLE AT THE UNDERWATER SOUND LABORATORY. VOLUME III,
by William S. Latham. 5 Apr 61, 71p. incl. illus. tables. (USL Research rept. no. 492. suppl. to USL Research rept. no. 216 and 294, AD-100 672)

Unclassified report

DESCRIPTORS: *Magnetic recording systems, Instrumentation, *Specifications, *Underwater sound laboratories, Underwater sound, Magnetic tape, Transducers, Electronic equipment.

Technical specifications of magnetic recording instrumentation are published with data on the associated components which have been designed and built to augment these systems. These components include mechanical, electromechanical, and electronic devices. (Author)

AD-259 131 Div. 30, 15
(7 July 61) OTS price $2.60

California U., Los Angeles.
A VERY HIGH-SPEED DIGITAL NUMBER SIEVE,
by D. G. Cantor, G. Estrin and others. May 61, 22p. incl. illus. tables (Rept. no. 61-22)
(Contract Nonr-23352)

Unclassified report

DESCRIPTORS: *Digital computers, *Number theory, Algebra, Programming, Mathematical computer data, Digital systems.

A method is presented to sift numbers satisfying a set of linear congruences from among a large set of numbers. The important properties of the resulting special-purpose device are that a relatively large set of numbers is processed essentially within the time required for performing a shift of one position in an ordinary shift-register, and that no memory references are necessary. This leads to an over-all speed gain of about three orders of magnitude over modern present-day computers such as the IBM 7090. By combining the device with a general-purpose computer, the size of problems that can be run is greatly increased with almost no decrease in speed. (Author)

AD-259 159 Div. 30, 9
(11 July 61) OTS price $5.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
DESIGN OF A LARGE, TWO-STAGE, LIGHT-GAS MODEL LAUNCHER,
by W. B. Stephenson and D. E. Anderson. June 61, 55p. incl. illus. tables (AEDC TR 61-6)
(Contract AF 40(600)800, Proj. 8950)

Unclassified report

DESCRIPTORS: Hypersonic wind tunnels, Launching, Design, Mathematical analysis, Helium, Gas flow, Tests, Instrumentation, *Hypervelocity guns.

A procedure is outlined for computing the performance of two-stage, light-gas launchers using helium as a propellant. The effects of the physical variables; geometry, piston mass, and pressures, are discussed. Design criteria are established for a large launcher which will be built for the Arnold Center (AFSC) ballistic range facility. Theoretical performance curves are included as well as experimental results obtained from two small launchers. (Author)

AD-259 166 Div. 30, 15
(10 July 61) OTS price $2.60

Army Ballistic Missile Agency, Huntsville, Ala.
A DIGITAL COMPUTER PROCEDURE FOR LEAST-SQUARES POLYNOMIAL APPROXIMATION,
by L. Neel Beard. 15 June 61, 25p. incl. illus. (Rept. no. RE-TR 61-3)

Unclassified report

DESCRIPTORS: *Digital computers, *Least squares method, Polynomials, Numerical analysis, *Programming.

Areas of application of least squares polynomial approximation (polynomial curve-fitting) are suggested and discussed. Suggestions on implementation of the technique are offered. Mathematical descriptions of the method of least squares and application of orthogonal polynomials are included. Flow-charts and a statement listing of a FORTRAN program to accomplish polynomial curve-fitting are also included. (Author)

AD-259 173 Div. 30, 8, 15
(18 July 61) OTS price $4.60

Electronic Systems Lab., Mass. Inst. of Tech., Cambridge.
A NOTE ON ERRORS INTRODUCED BY COMBINED SAMPLING AND QUANTIZATION,
by Jacob Katzenelson. Mar 61, 39p. incl. illus. 10 refs. (Rept. no. ESL-TM-101)
(Contracts AF 33(616)7700 and DA 19-020-ORD-2437)

Unclassified report

DESCRIPTORS: *Digital computers, *Sampling, *Linear systems, *Electric filters, Errors, Electronic systems, Circuits, Statistical analysis, Mathematical analysis, Least squares method, Microwave networks, Electrical networks.

In digital computations, errors resulting from sampling and amplitude quantization (round off) are unavoidable. This work evaluates the mean-square error caused by sampling and quantization at the output of a linear network which contains a single quantizer. A detailed answer is given to the question: Given quantized samples of a signal which is a sample function of a random process, what is the optimum linear filter for recovering the signal from its samples. This filter is determined and its characteristics are summarized graphically for a specific example. A comparison with the conventional hold graphically for a specific example. A comparison with the conventional hold circuit shows that the optimum filter is much better if high accuracy is required and quantization is coarse. The difference in performance between the two filters is small when the

accuracy requirement is low and the quantization is fine. Also included as an appendix is a survey of the general quantization errors problem, as it appears in the areas of digital computation and numerical analysis, and a study of multi-quantizer networks. It is found that extension of the method to networks which contain more than one quantizer is impractical, if not impossible. (Author)

AD-259 229 Div. 30, 25, 8
(11 July 61) OTS price $10.10

International Business Machines Corp., Poughkeepsie, N. Y.
PROJECT LIGHTNING.
Quarterly progress rept. no. 8, 31 Aug-30 Nov 60, 30 Nov 60, 119p. incl. illus. tables.
(Contract NObsr-77508)
Unclassified report

DESCRIPTORS: *Cryogenics, Mathematical logic, *Computers *Data processing systems, Thin films, *Switching circuits, Circuits, Superconductors, Trigger circuits, Thermal conductivity, Measurement, Materials, *Memory devices, Design.

Work was continued in cryogenics and associated machine organization devoted to evaluating the feasibility of a computer system capable of performing basic logic operations at a rate of 1000 mc. It was concluded that substantial improvement in the efficiency of a kilomegacycle cryotronic machine can be obtained by reducing the planar dimensions of the circuits and using a substrate having high thermal conductivity. Efforts were made to find substrates which can be used for circuits and which will alleviate the heat problem by increasing the thermal conductivity to the bath. A first set of results was obtained in the multiplexing study and preliminary data on the effect of queue length are reported. A plan to design and construct a high-speed addressable memory was prepared. The modifications of the cryotron network simulator resulted in simulation results that agreed with experimental results for slow crossed-film cryotron circuits.

AD-259 239 Div. 30, 32
(11 July 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
TECHNICAL INFORMATION AND BIBLIOGRAPHICAL CENTERS IN THE USSR (Tekhniko-Informatsionnye i Bibliograficheskiye Tsentry v SSSR i Izdavayemye Imi Materialy),
by Ye. N. Morozova. 10 Feb 61, 31p. (Trans. no. MCL-796 of Obshchestvo Po Rasprostraneniyu Polsticheskikh i Nauchnykh Znaniy RSFSR; Leningradskiy Dom Nauchno-Tekhnicheskoy Propagandy, Leningrad: pp. 1-23, 1959)
Unclassified report

DESCRIPTORS: *Scientific research, USSR, Bibliography, Technological intelligence, *Libraries, Scientific reports, Records, Reports.

AD-259 293 Div. 30
(11 July 61) OTS price $3.60

Electric Boat Div., General Dynamics Corp., Groton, Conn.
DATA PROCESSING PROGRAM FOR THE FILTERING, CORRELATION, AND POWER SPECTRAL ESTIMATION OF SAMPLED DATA,
by Charles R. Arnold and Zave W. Lenefsky. 28 June 61, 38p. incl. illus. (Rept. no. CSD60-011)
(Contract Nonr-251200)
Unclassified report

DESCRIPTORS: *Data processing systems, Digital computers, *Programming, Mathematical analysis.

A data processing program is described for the IBM-704 digital computer. The program implements the filtering, correlation, and power spectral estimation of sampled data, as well as other minor calculations. A complete list of the specific operations and calculations that the program may be directed to perform is given in Section II where the main control program is described. Section II also contains a description of the input-output of the program with an example of an actual program computation. The remainder of the report (Sections III-V) is devoted to a detailed description of the (relocatable) subroutines which were included in the main program.

AD-259 295 Div. 30
(10 July 61) OTS price $1.10

Hesse-Eastern Div., Flightex Fabrics, Inc., Everett, Mass.
DEVELOPMENT OF HIGH LOADING RATE TESTING MACHINE.
Quarterly progress rept. no. 5, 1 Mar-31 May 61, by Robert E. Sebring. 31 May 61, 5p. (Rept. no. Q-5-60J)
(Contract DA 19-020-501-ORD-5164; Proj. TW-120)
Unclassified report

DESCRIPTORS: Test equipment, Test methods, *Machines, Loading, Design, Tests, Hydraulic systems, *Tensile properties, Pneumatic systems, Valves, Hydraulic cylinders, *Hydraulic valves, Velocity, Hydraulic fluids.

Efforts were concerned with design, installation, and test of new components calculated to improve maximum rate performance of the machine. The first design change which was instituted was the replacement of the heads of the loading cylinder with new heads which provided more generous internal flow passages, and larger cylinder port connections. Next an effort was made to obtain a faster valve action, and a greater flow rate through the loading valve. The original valve installed was of the pilot piston type, and it was felt that a direct acting valve might minimize the delay time. A direct acting valve, with an impact type actuator was obtained, and was of a size to provide the maximum port area possible with the use of the machine operating pressures. Performance with this valve was very slow (100 milliseconds) and it was obvious that a pilot type valve, with full size ports, would be required. There are presently two factors contributing to the limitation of machine operating speed. The first of these is the presence of gas bubbles in the operating fluid. The second obstacle is the necessity for obtaining a higher volumetric flow rate through the loading valve operation. (Author)

AD-259 296 Div. 30
(10 July 61) OTS price $1.60

Human Sciences Research, Inc., Arlington, Va.
A COMPARISON OF TWO DIVERSE METHODOLOGICAL

APPROACHES TO RESEARCH ON COMPLEX SYSTEMS,
by W. S. Vaughan, Jr. and J. E. McGrath. Nov 59, 13p. illus. (Rept. no. 2; HSR-RM-59/22-sm)
(Contract Nonr-252500)
Unclassified report

Paper presented at the Sixty-sixth Annual Convention of the American Psychological Association, September 1, 1958.

DESCRIPTORS: Human engineering, *Research program administration, Mathematical analysis, *Operations research, Data processing systems, Scientific research.

AD-259 300 Div. 30, 2
(20 July 61) OTS price $2.60

4th Weather Group, Eglin Air Force Base, Fla.
ELECTRONIC COMPUTER REDUCTION OF UPPER AIR DATA,
by O. H. Daniel. 28 June 61, 20p. incl. tables.
(4th WG Pamphlet no. 105-7-2)
Unclassified report

DESCRIPTORS: Upper atmosphere, *Digital computers, Analog-to-digital converters, *Meteorological data, Meteorological instruments, Radiosondes, *Data processing systems, Mathematical computer data.

Electronic computer reduction of upper air data is presented. The computational techniques included are: (1) Expressions which will permit the use of the ML-418/AMT-4, or the ML-476( )/AMT Humidity Element, (2) the use of the N-S and E-W components of the surface wind along with the lowest rawin data to obtain the 500-ft wind and the wind at the 1000-mb level, (3) incorporation of a correction to the elevation angles recorded by the Control Recorder to account for the curvature of the earth and the index of refraction, (4) the use of 2-min smoothing for wind computations when elevation angles of the tracking equipment are 15 degrees or higher and 4-min smoothing when elevation angles are below 15 degrees to minimize the effects of antenna hunting at the lower elevation angles, and (5) an expression used for the computation of temperature from radiosonde recorder division values to provide for better accuracy throughout all calibration and scale ranges. (Author)

AD-259 326 Div. 30, 25
(21 July 61) OTS price $2.60

National Bureau of Standards, Washington, D. C.
STANDARDIZATION OF THERMAL EMITTNANE MEASUREMENTS.
Rept. for 1 July 59-30 June 60 on Materials Analysis and Evaluation Techniques,
by William N. Harrison, Joseph C. Richmond and others. Feb 61, 21p. incl. illus. tables.
(Contract AF 33(616)58-20, Proj. 7360)
(WADC TR 59-510, pt. 2) Unclassified report

DESCRIPTORS: *Thermal radiation, *Blackbody radiation, Infrared spectroscopy, *Monochromatic light, Measurement, Materials, Standardization, Mathematical analysis, Digital recording systems, Optical spectrometers, Data processing systems.

Work was directed toward establishment of equipment and procedures for the evaluation of normal spectral emittance of specimens held at temperatures in the range of approximately 800 to 1400 K (980 to 2060 F), over the wavelength range of 1 to 15 microns. Some of the developments were modified to increase precision and reduce errors in the measurements. One such modification was to provide means whereby a reference blackbody furnace and the hot specimen could be interchanged at will as sources of radiant flux to be measured relative to that from the comparison blackbody furnace. The apparent emittance of the specimen and of the reference blackbody furnace were both measured relative to the comparison blackbody furnace. The apparent emittance of the specimen at each of numerous selected wavelengths was then divided by the corresponding apparent emittance of the reference blackbody furnace to obtain the reported spectral emittance of the specimen. Assembly of the equipment for determination of spectral reflectance, under conditions approximating normal illumination and hemispherical viewing, was completed. (Author)

AD-259 362 Div. 30, 27, 14
(11 July 61) OTS price $12.00

Perkin-Elmer Corp., Norwalk, Conn.
FEASIBILITY STUDY OF A NON-DESTRUCTIVE TESTING INFRARED INSPECTION SYSTEM FOR BONDING FLAW DETECTION.
Interim rept. no. 2, Nov 60-Apr 61.
by Paul Yetitto and Richard Gorman. Apr 61, 168p. incl. illus. (Rept. no. PE-TR-5959)
(Contract DA 19-020-ORD-5243)
Unclassified report

DESCRIPTORS: *Bonded joints, *Non-destructive testing, Infrared equipment, Rocket cases, Solid rocket propellants, Combustion chamber liners, Quality control, Test equipment, Test methods, Heat transfer, Bonding.

An investigation was begun to establish the feasibility of IR measuring techniques for detecting bond failures (flaws or voids) between rocket casings and the insulating liner and between the liner and the solid propellant. The IR detection principles involve (1) the injection of heat into the rocket casing over a small area surrounding the point of measurement, (2) detection of variations in wall diffusivity by the time varying emission characteristic from the region of heat application, and (3) evaluation of fluctuations of the emission characteristic by comparison of the signal to that arising from a flawless bond. Preliminary measurements were made on flat plate samples with known flaw configurations. An intensive analysis of heat flow mechanisms in bonded structures has progressed from the formal solution of partial differential equations to the creation of an electric analog model of the 1 dimensional heat flow problem. Analog results indicate that a flaw between the case and liner about 0.1 cm separation and 0.78 sq cm nominal area is detectable with a maximum contrast ratio of 6.7% between 2 and 5 sec after heat injection. A similar defect between the liner and propellant gives a maximum surface contrast ratio of 16.5% about 10 sec after heat injection.

AD-259 395 Div. 30, 8, 25
(11 July 61) OTS price $2.25

Westinghouse Electric Corp., Baltimore, Md.
ELECTROLUMINESCENT-PHOTORESPONSIVE COMPUTER ELEMENT RESEARCH.
Final rept.,
31 Aug 60, 85p. incl. illus. tables, 38 refs.
(Westinghouse rept. no. 4505)
(Contract AF 33(616)6304, Proj. 7062)
(WADD TR 60-863) Unclassified report

DESCRIPTORS: Electrical properties, *Luminescence, *Photoconductivity, *Computers, *Switching circuits, Impedance, Brightness, Sensitivity, Design, Materials, Electronic circuits, Mathematical analysis, *Electronic relays.

Research was concerned with the development of an electroluminescent-photoresponsive (EL-PR) computer element. The objective was the development of a computer element with microsecond switching speed, an impedance ratio of 50 to 1 off to on, and a power gain greater than unity. Existing electroluminescent and photoconductive devices and materials, as well as anticipated improved versions of these devices and materials were analyzed. These investigations show that either the microsecond switching speed and the 50 to 1 impedance ratio or the power gain greater than unity and 50 to 1 impedance ratio could be realized with existing materials. However, the achievement of all three objectives in the simple EL-PC (Photoconductive) device will require a major breakthrough either in the form of EL materials with greater efficiency or a PC device with inherent gain. (Author)

AD-259 472 Div. 30, 7
(13 July 61) OTS price $6.60

Gulton Industries, Inc., Metuchen, N. J.
EVALUATION OF NICKEL-CADMIUM BATTERY TESTERS.
Quarterly progress rept. no. 3, 1 Jan-31 Mar 61 on The Determination of the Accuracy and Reliability of the Vitro Tester and the Optimum Procedure for its use.
by A. S. Cherdak and H. N. Seiger. 31 Mar 61, 63p. incl. illus. tables.
(Contract DA 36-039-sc-85066, Proj. 3G18-03-001)
Unclassified report

DESCRIPTORS: *Alkaline cells, *Storage batteries, *Wet cells, Test equipment, Tests, Test methods, Reliability, Nickel, Cadmium, Temperature, Power supplies, Instrumentation, *Test sets.

Several modifications have been made in the tester program which have eliminated high-current pulses due to anticipated damage to the cells under test. Pulsing of the BB412/U cells at -40 F has been eliminated due to the complete freezing of these cells. The accuracy of the tester is presented in the form of a graph. Phase B (storage testing) is in operation, and a partial evaluation has been made. The cycling equipment for Phase C was completed and cycling has been started. Due to questionable operation of cells on cycle, the cycle rates of the BB403/U and the BB418/U cells have been cut in half. (Author)

AD-259 487 Div. 30, 15
(12 July 61) OTS price $2.60

Electronic Systems Lab., Mass. Inst. of Tech., Cambridge.
A PRELIMINARY INVESTIGATION OF THE ANALOG-DIGITAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS.
Final technical rept.
by Solomon Max. Mar 61, 17p. incl. illus.
(Rept. no. ESL-R-108)
(Contract DA 19-020-ORD-5267)
Unclassified report

DESCRIPTORS: Computers, *Analog computers, *Digital computers, *Partial differential equations, Integration, Numerical analysis, *Analog to digital converter.

An outline is given of a proposed combined analog-digital system for solving partial differential equations more rapidly than is presently possible. The method involves the use of an analog memory device in conjunction with a small general purpose digital computer. An estimate of the rate of convergence of the system to the exact answer is derived and experimentally verified. (Author)

AD-259 492 Div. 30, 5
(14 July 61) OTS price $2.60

Farrington Electronics, Inc., Needham, Mass.
SYSTEMS RESEARCH STUDY ON OPTICAL CHARACTER RECOGNITION.
Research rept.
Feb 61, 20p. incl. tables.
(Contract Nonr-316200)
Unclassified report

DESCRIPTORS: *Optical systems, *Data processing systems, *Reading machines, Analysis, Errors, Tests, Electronic scanners, Optical images, Optical equipment, Digital computers, Digital recording systems.

The feasibility was investigated of using optical scanning techniques for converting typewritten material which is created aboard ships to suitable media for input to data processing systems. The accuracy of such conversion was also investigated. The results of analyses and reading tests indicated that material prepared and read under similar conditions (with same type machine that was used in the reading test) would have over-all unreadable and document error rates of 42% and 3.03%, respectively for one pass of the documents through the machine, or 33% and 3.9% respectively for two passes.

AD-259 494 Div. 30, 23
(13 July 61) OTS price $3.60

Marine Corps Equipment Board, Quantico, Va.
AUTOMATIC TEACHING MACHINE, DEVICES.
Interim rept. no. 1, pt. 1.
6 July 61, 34p. incl. illus. tables.
(Proj. 31-61-02)
Unclassified report

DESCRIPTORS: Automatic, Training films, Film readers, Documentation, Personnel, *Teaching machines, Acceptability, Military requirements, Procurement.

Several automatic teaching devices were studied and evaluated to determine which machines are most applicable for Marine Corps use on the enlisted level. A unit test was employed to determine whether a training device and technique can be employed to further training efficiencies and economies under peace and/or wartime conditions. Automatic teaching machines were designed for visual presentation of information and questioning, with or without the aid of human teachers, in such a way that student comprehension and retention were encouraged. Active student participation is necessary in teaching machine utilization. Automatic teaching devices have potential application in the Marine Corps but the very large and new teaching machine market should undergo a year of scrutiny before the Marine Corps conducts extensive research on them or purchases them in large quantities. (Author)

AD-259 561 Div. 30, 32, 8
(13 July 61) OTS price $5.60

Towson Labs., Inc., Md.
DEVELOPMENT OF 10 BIT AIRBORNE ANALOG TO DIGITAL CONVERTER.
Final rept.,
by Gerald B. Gilbert and Charles W. Barbour.
16 Jan 61, 51p. incl. illus.
(Contract NOw 60-0256-c)
Unclassified report

DESCRIPTORS: *Analog to digital converters, Electronic circuits, Design, Effectiveness, Military requirements, Airborne, Electronic switches, Mathematical analysis, Coding, Tests, Electronic equipment.

The development of a radically new type of successive approximation, analog to digital converter employing the rapid and accurate exchange of charge between several capacitors is described. The method makes possible a startling reduction in number of circuit components, total power consumption, size and weight. Furthermore, the technique offers added performance capability with regard to accuracy and speed. Two experimental units were constructed and tested. These units provide 10-bit resolution, 18181 encodings per second, 200-kc bit rate, NRZ output, full-scale input of 0 to +5 volts, input impedance of 1 megohm, inherent sample and hold, continuous operation, or encode upon command. The units use only 45 transistors, require only 6.3 watts from the power supply, and have a volume of only 125 cubic inches and a weight of 3.25 pounds. Recommendations are included for several extensions of the development program to provide higher speeds, with further simplification, military prototype design, lower power consumption, and an unusual multiplexer based on capacitive charge transfer. (Author)

AD-259 712 Div. 30, 15
(18 July 61) OTS price $6.60

California U., Los Angeles.
COMPUTATION OF ELEMENTARY FUNCTIONS, IN x AND ex, IN A VARIABLE STRUCTURE COMPUTER,
by D. Cantor, G. Estrin, and R. Turn. Apr 61, 59p. incl. illus. tables. (Rept. no. 61-16)
(Contract Nonr-23352)
Unclassified report

DESCRIPTORS: *Computers, *Digital computers, *Programming, Numerical analysis, Functions, Polynomials, Transformations (Mathematics), *Electronic circuits, Electronic systems, Memory devices, Numerical methods and procedures.

Sequential table lookup algorithms are proposed for the evaluation of Ln x and exp x. These algorithms are particularly effective when mechanized within the variable structure part of UCLA's proposed Fixed-Plus-Variable structure computer. The sequential table lookup algorithms and their speed advantage over existing subroutine approximation procedures are described. The design of special purpose configurations of the variable structure part of the system which lead to another factor of speed increase as compared to a stored program implementation of the algorithms is presented. The properties of the supervisory control which integrate the operation of the fixed structure general purpose computer and the variable structure special purpose configurations are specified and the over-all computational gains evaluated. (Author)

AD-259 716 Div. 30
(18 July 61) OTS price $22.25

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
FEASIBILITY STUDY ON A DYNAMIC ESCAPE SIMULATOR (HUMAN CENTRIFUGE).
Final rept.,
by Klaus L. Cappel, C. A. Belsterling and others.
May 61, 425p. incl. illus. tables (Rept. no. F-A2407)
(Contract AF 33(616)7118)
Unclassified report

DESCRIPTORS: *Centrifuges, Man, Biophysics, Design, Simulation, *Bailout, Acceleration, *Flight simulators, Construction, Specifications, Configuration.

The construction of a device capable of simulating the acceleration patterns of escape from high speed aircraft was found to be feasible. The reduction in the rates of simultaneous rotation of the main arm, fork and cab is recommended in the interest of economy and protection of the subject from excessive gyroscopic forces. The construction of the major components of the proposed Simulator is within the state-of-the-art and can be accomplished with existing techniques. A high proportion of the components are shelf items which have proved satisfactory in operation. (Author)

AD-259 727 Div. 30, 32
(18 July 61) OTS price $1.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
A 6-SYMBOL 6-STATE UNIVERSAL TURING MACHINE,
by M. Minsky. 12 Apr 61, 15p. incl. illus. (Rept. no. 546-0029)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: Mathematical prediction, *Coding, Programming, Computers, *Documentation, *Machine translation, Theory.

AD-259 742 Div. 30
(18 July 61) OTS price $3.60

California U., Los Angeles.
THE FIXED-PLUS-VARIABLE COMPUTER SYSTEM IN DYNAMIC PROGRAMMING FORMULATION OF CONTROL SYSTEM OPTIMIZATION PROBLEMS. PART I,
by Masanao Aoki and Gerald Estrin. May 61, 33p. incl. illus. (Rept. no. 60-66)
(Contract Nonr-23352)
Unclassified report

DESCRIPTORS: Cybernetics, *Computers, *Digital computers, *Programming, Control systems, Numerical analysis, Functions.

An initial investigation of the use of the fixed plus variable computer to solve a class of control system optimization problems is reported. In particular, two modes of operations are recognized and the loosely coupled mode is discussed in some detail in an attempt to define functions that the supervisory control must perform and the inventory of the variable structure needed for the problem considered. During the course of this initial study some effective rejection criteria have been evolved which may considerably reduce the amount of interpolation required. (Author)

# Division 30 - RESEARCH AND RESEARCH EQUIPMENT

AD-259 763 Div. 30, 13
(18 July 61) OTS price $7.60

Frankford Arsenal, Philadelphia, Pa.
STUDY ON THE APPLICATION OF MULTIPURPOSE AUTOMATIC INSPECTION AND DIAGNOSTIC SYSTEMS (MAIDS) TO ARMY MAINTENANCE SYSTEM IN THE PERIOD 1962-72.
Rept. on Phase 1.
July 61, 76p. incl. tables, 55 refs.
Unclassified report

DESCRIPTORS: Computers, Automation, *Automatic weapons, *Maintenance, Electronic equipment, *Vehicles, Guided missiles, Digital computers, Maintenance tools, *Maintenance equipment, Test methods.

AD-259 764 Div. 30, 10, 22
(17 July 61) OTS price $3.60

Frankford Arsenal, Philadelphia, Pa.
REDESIGN OF THE VENTED VESSEL,
by A. Magar. Apr 61, 31p. incl. illus. tables.
(FA rept. no. R-1559)
(WADD TR 60-755) Unclassified report

DESCRIPTORS: *Laboratory equipment, *Pressure vessels, Design, *Propellants, Combustion, *Combustion chambers, Ignition systems, Ignition, *Explosive actuators, High pressure research, High temperature research, Exhaust nozzles, Steel, Test methods, Test equipment.

Design changes in the vented vessel, a laboratory device used in the study of propellant burning rates are described. The new design permits the use of different igniter cartridge sizes and different combustion chamber sizes, yet it is lighter in weight and shorter in over-all length. It incorporates the principle of radial ignition, is equipped with nickel-on-copper base nozzle inserts, can be converted to a closed bomb device, and is provided with a mount for recording thrust measurements. A high-pressure rupture-disk assembly is an added safety feature. The body of the vented vessel is constructed of high-strength, temperature-resistant, nickel-chromium-molybdenum alloy steel to increase its operational temperature and pressure ranges. (Author)

AD-259 778 Div. 30, 15
(19 July 61) OTS price $1.60

Pennsylvania U., Philadelphia.
DYNAMIC OWN-ARRAY DECLARATIONS,
by Peter Zilahy Ingerman, E. T. Irons, and others. Nov 60, 7p. incl. table.
(Contract AF 49(638)951)
(AFOSR TN 60-1319) Unclassified report

DESCRIPTORS: *Computers, *Complex variables, Real variables, Programming, *Data storage systems, Data processing systems, Sequences.

AD-259 779 Div. 30, 15
(19 July 61) OTS price $1.60

Pennsylvania U., Philadelphia.
THUNKS. A WAY OF COMPILING PROCEDURE STATEMENTS WITH SOME COMMENTS ON PROCEDURE DECLARATIONS,
by Peter Zilahy Ingerman, E. T. Irons, and others. Nov 60, 11p.
(Contract AF 49(638)951)
(AFOSR TN 60-1318) Unclassified report

DESCRIPTORS: *Computers, *Data processing systems, *Data storage systems, *Data transmission systems, Complex variables, Real variables, Sequences, *Coding, Programming.

This paper presents a technique for the implementation of procedure statements of ALGOL 60 with some comments on the implementation of procedure declarations. It was felt that a solution which had both elegance and mechanizability was more desirable than a brute-force solution. It is to be explicitly understood that this solution is one acceptable solution to a problem soluble in many ways. (Author)

AD-259 780 Div. 30, 15
(19 July 61) OTS price $1.60

Pennsylvania U., Philadelphia.
THE ALLOCATION OF STORAGE FOR ARRAYS IN ALGOL-60,
by Kirk Sattley and Peter Zilahy Ingerman.
Nov 60, 15p.
(Contract AF 49(638)951)
(AFOSR TN 60-1320) Unclassified report

DESCRIPTORS: *Computers, *Data processing systems, *Data storage systems, Special functions, *Data transmission systems, Complex variables, Real variables, Sequences, *Coding, Programming.

One of the more challenging features of ALGOL 60 is the possibility of allowing the dimensions of both own and non-own arrays to be defined by variables which take on their values only dynamically, so that no fixed amount of storage in the computer can be reserved by the compiler at compilation time. The purpose of this paper is to demonstrate the realizability of this feature of the language by presenting a model of such an allocator. The basis of the approach used here is that of allowing the translator include in the coding it puts out copies of those of its own functions which must, because of the specification of the problem, be carried out at run time. The mechanism described in this paper is independent of the possible presence of recursive procedures in the program. (Author)

AD-259 782 Div. 30, 15
(19 July 61) OTS price $3.60

Pennsylvania U., Philadelphia.
THE TREATMENT OF AMBIGUITY AND PARADOX IN MECHANICAL LANGUAGES,
by Saul Gorn. Apr 61, 33p. incl. illus.
(Contract AF 49(638)951)
(AFOSR-603) Unclassified report

DESCRIPTORS: *Computers, *Data processing systems, *Data storage systems, *Data transmission systems, *Language, Complex variables, Real variables, *Coding, Sequences, Theory, Functions.

A summary is given of the basic definitions of the theory of mechanical languages, and of the main processors for the prefix languages. A discussion is given of language extension with the examples of hierarchies of extensions in prefix languages. The relationship is established between language extension and increase in control ambiguity. A language of syntactic ambiguity descriptions is designed and the effective processor translating from this language to the derived-language naming language is specified.

The concepts of recognition depth for both syntactic ambiguities and analyzability of mechanical languages are developed, and examples are given to show the existence of both types at all depths, including infinite depth. Examples of control ambiguity are developed ranging from the extremely useful to the paradoxical. Among the paradoxes analyzed in this way are the Epimenides paradox, the Lewis Carroll Tortoise and Achilles paradox, and the Russell paradox. (Author)

AD-259 783 Div. 30, 15
(19 July 61) OTS price $1.60

Pennsylvania U., Philadelphia.
COMMENTS ON THE IMPLEMENTATION OF RECURSIVE PROCEDURES AND BLOCKS IN ALGOL-60,
by E. T. Irons and W. Feurzeig. Nov 60, 15p. incl. illus.
(Contract AF 49(638)951)
(AFOSR TN 60-1321) Unclassified report

DESCRIPTORS: *Computers, *Data processing systems, *Data storage systems, *Data transmission systems, Complex variables, Real variables, Sequences, *Coding, *Programming, Language.

Because of the importance, from the theoretical point of view, of recursive functions and because of the growing extent and direction of application of recursion in programming research and experimental mathematics, it is worth some effort to implement recursion - given that the costs in compilation and storage requirements are not too great. The mechanism for treating recursive procedures described here is such that the costs in time and storage to procedures involved in recursion are no more than necessary for a completely general recursion mechanism for ALGOL 60. (Author)

AD-259 810 Div. 30, 31
(19 July 61) OTS price $3.60

Institute of Engineering Research, U. of Calif., Berkeley.
EXPERIMENTAL INVESTIGATION OF THE VERTICAL FORCES ACTING ON PROLATE SPHEROIDS IN SINUSOIDAL HEAVE MOTION,
by Thomas C. Watson. Apr 61, 33p. illus. (Series no. 82, Issue no. 18)
(Contract Nonr-22230)
Unclassified report

DESCRIPTORS: Ocean waves, *Ship models, *Model basins, Oscillation, Pressure, Cylindrical bodies, Ellipsoids, Damping, Model tests.

A planar motion generator for constraining a small ship model to pure sinusoidal motion in any one of several degrees of freedom plus combinations of certain of these, was designed and constructed. The apparatus, briefly described here, was tested for operation in heave motion only. Presented herein are the results of vertical force measurements made for each of three horizontal, prolate spheroids oscillating at various frequencies in a free surface and at different depths of submergence. The measured forces for the surface tests are compared with results obtained by strip calculations. Theoretical values of added mass and damping for a horizontal, semi-immersed, circular cylinder of infinite length oscillating in heave were used in the strip calculations. (Author)

AD-259 888 Div. 30, 9, 25
(31 July 61) OTS price $5.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
DETERMINATION OF TEST-SECTION, AFTER-SHOCK, AND STAGNATION CONDITIONS IN HOTSHOT TUNNELS USING REAL NITROGEN AT TEMPERATURES FROM 3000 TO 4000 K,
by Martin Grabau, Richard L. Humphrey and Wanda J. Little. July 61, 57p. incl. illus. tables, 12 refs. (Rept. no. AEDC TN 61-82)
(Contract AF 40(600)800)
Unclassified report

DESCRIPTORS: *Hypersonic wind tunnels, Gas flow, Mathematical analysis, Nitrogen, Pressure, Temperature, *Thermodynamics, Aerodynamics, *Hypersonics.

A new method is set forth for computation of test-section, after-shock, and stagnation conditions in hotshot tunnels of Arnold Center, using nitrogen at stagnation temperatures from 3000 to 4000 K. The basic data are the pressure and temperature of the gas in the arc chamber prior to firing the arc, the pressure in the arc chamber after firing the arc, and the pitot pressure in the test section. The latter 2 quantities are functions of time. Whenever possible, advantage is taken of perfect gas relationships. Allowance is made for the time of transit of a pressure signal between the throat and the test section. (Author)

AD-259 897 Div. 30, 9
(24 July 61) OTS price $4.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
FURTHER DEVELOPMENT OF AN INDUCTANCE-DRIVEN HOTSHOT TUNNEL,
by J. A. van der Bliek, H. E. Deskins, and R. R. Walker, III. July 61, 41p. incl. illus.
(AEDC TN 61-80)
(Contract AF 40(600)800, Proj. 360106)
Unclassified report

DESCRIPTORS: *Hypersonic wind tunnels, Design, Wind tunnels, *Hypersonics, Aerodynamics, Drag, Aerodynamic configurations, Heat transfer, Nitrogen, Pressure, Measurement.

The development and evaluation of arc chambers for the inductance-driven tunnel Hotshot 2 is described. A coaxial electrode arc chamber configuration was developed which, when used with a nine millisecond arc discharge time, resulted in a further significant decrease in flow contamination. Drag measurements on slender models with this arc chamber were in substantial agreement with drag measurements carried out in other tunnels in the Mach number range from 16 to 22. Measurements of stagnation point heat transfer rate improved as contamination was reduced, but the consistency of the measurements was not satisfactory. All tests described herein were carried out with nitrogen at stagnation temperatures from 3000 to 4000 K and stagnation pressures from 10,000 to 20,000 psi. (Author)

AD-259 906 Div. 30, 15
(24 July 61) OTS price $8.60

Electronics Research Lab., U. of Calif. Berkeley.
ON THE IDENTIFICATION AND ADAPTIVE CONTROL OF SAMPLED-DATA SYSTEMS,
Thesis.
by G. G. Lendaris. 21 Mar 61, 58p. incl. illus.
(Series no. 60, Issue no. 351)
(Contract AF 18(600)1521)
(AFOSR-720) Unclassified report

DESCRIPTORS: *Control systems, Sampling, Mathematical analysis, Digital computers, Linear systems.

A procedure is presented for identifying a linear, lumped-parameter, time-invariant (at least during the measurement period), single-input system from its response to a step excitation. Then, an adaptive sampled-data control system is designed using a digital computer to perform this identification procedure and to act as the controller for the system. The system was actually built, and some experimental results are cited. This identification technique requires 2n + 1 measurements of the magnitude of the output, where n is the order of the system and the measurements are taken at equally spaced intervals of time. These measurements are used as the coefficients in n scalar equations whose n unknowns are the coefficients of the z-transformed characteristic equation of the system. This set of n scalar equations is solved for these coefficients (on a digital computer). For some applications, this characterization of the system is sufficient; when it is not, then this equation is factored to yield the system's z-plane poles, and from this, the corresponding s-plane poles are found. This procedure is independent of initial conditions and will work for any such system (even for the multiple eigenvalue case) the only restriction being that all the poles of the system be excited when the measurements are made. (Author)

AD-259 926 Div. 30, 5, 25
(24 July 61) OTS price $5.60

Armour Research Foundation, Chicago, Ill.
INSTRUMENTATION AND MEASUREMENT TECHNIQUES STUDY.
Quarterly rept. no. 9, 1 Feb-30 Apr 61,
by H. G. Tobin. 30 Apr 61, 50p. incl. illus.
(Rept. no. ARF 5112-27)
(Contract DA 36-039-sc-78269)
Unclassified report

DESCRIPTORS: Instrumentation, Measurement, Test equipment, Electronic equipment, *Test sets, Military equipment, Impedance, Printed circuits, Voltmeters, *Electronic circuits, *Field wire communication systems, Calibration, Maintenance equipment, *Magnetic recording systems, *Electrolytic capacitors, Signal to noise ratio, *Semiconductors, *Transistors, Alternating current, Standards.

A square-wave technique for isolating faulty components in conventionally-wired or printed circuitry without the need of unsoldering is presented. Preliminary study indicates that the technique may enable general identification of the type of circuit fault involved. Another technique to assist in faulty component identification utilizes a low voltage source to permit impedance measurements to be made in transistor or diode circuitry. A combination of the 2 techniques may enable fairly rapid isolation of a faulty component to be made. Techniques for locating faults in long-line spiral-four and open wire systems were investigated. One promising approach involves measuring the phase angle of the input impedance of the line, and comparing this data with previously measured or calculated information. A survey of commercial ac voltage standards was made in order to determine the capabilities of such units for providing a source for voltmeter calibration. A discussion of the capabilities and limitations of magnetic recording in the area of automatic testing is presented. (Author)

AD-259 994 Div. 30
(24 July 61) OTS price $12.00

Brooklyn Coll., N. Y.
RESEARCH IN THE AUTOMATION OF TEACHING,
by Carl B. Zuckerman, George R. Marshall and others. 16 Feb 61, 160p. incl. illus. tables.
(Contract N61339-661)
(Technical rept. no. NAVTRADEVCEN 661-1)
Unclassified report

DESCRIPTORS: *Teaching machines, Automation, Training, Training devices, Circuits, Wiring diagrams, Effectiveness, Learning.

The Skinner Teaching Machine was compared with more traditional teaching methods. Material from the U. S. Navy Basic Electricity course was used. For the first experiment, material was programmed into 3 series of items: one of completion, one of multiple-choice and one of true-false items. Each series was presented in a logical order and in a random sequence. Six groups of subjects were used, one for each kind of presentation (i.e., Random Completion, Sequential, True-False, etc.). Statistical analysis of the results revealed no significant difference between random and sequential presentation, between the different kinds of items or between machine and prompting card learning. In later experiments, a group of subjects learned the same material by means of a lecture presentation and another group by reading the text. Both groups received the same examination as those in the first experiment. The text group did significantly better than the machine group and better than the lecture group. The lecture group did significantly better than the machine group. (Author)

## 31. SHIPS AND MARINE EQUIPMENT

AD-259 095 Div. 31
(21 July 61) OTS price $2.60

David Taylor Model Basin, Washington, D. C.
FULL-SCALE SLAMMING TESTS ON LANDING CRAFT LCP-L MK4,
by A. E. Hirsch. May 61, 21p. incl. illus. table.
(Rept. no. 1481)
Unclassified report

DESCRIPTORS: *Landing craft, Naval vessels, Design, Ship hulls, Impact shock, Motion, Tests, Accelerometers, Pressure, Load distribution, Water waves, Acceleration, Hydrodynamics, Personnel, Military personnel.

Pressures along the hull bottom of a 36-ft landing craft, LCP-L MK 4, were measured for a series of speeds and headings in a heavy seaway. The peak slam pressures at selected positions along the hull bottom, as a function of forward speed and heading relative to the waves, are presented. Tests were made in an effort to establish a correlation between full-scale and small-scale slamming studies. (Author)

AD-259 225 Div. 31
(20 July 61) OTS price $3.60

Naval Submarine Base, New London, Conn.
RECOMMENDED PRESCRIBED VIBRATION AND NOISE LIMITS FOR AUXILIARY MACHINERY ABOARD SUBMARINES USING THE GR 1551-A SOUND LEVEL METER AND PROBE,
by Robert York Chapman and D. E. McIntyre.
1 Jan 60, 28p. incl. illus. tables (Technical rept. no. 203-60, Revision no. 3; Supersedes Technical repts. no. 135-56, 136-56, and 145-58)
(Proj. S-F013-1101)

Unclassified report

DESCRIPTORS: Vibration, Measurement, Instrumentation, Noise, Detection, *Submarine noise, Attenuation, Test equipment, *Noise analyzers.

Additional CHAPMAN NUMBERS are presented for auxiliary machinery on ALL classes of submarines. Recommended for the first time is the application of this instrument to evaluate dynamic balance in rotational machinery that is resilient mounted. Also included is a method to determine the frequency of the vibrating body as detected by the pickup, if a steady state of motion exists. (Author)

AD-259 227 Div. 31, 25, 27
(20 July 61) OTS price $3.60

Naval Submarine Base, New London, Conn.
AUXILIARY MACHINERY NOISE AND VIBRATION MEASUREMENTS FOR 598 CLASS SSB(N)'S,
by Robert York Chapman. 1 Apr 61, 36p. incl. illus. tables (Technical rept. no. 211-61)
(Proj. S-F013-11-01)

Unclassified report

DESCRIPTORS: Submarines, *Submarine noise, *Noise, Low frequency, Detection, Electric motor noise, Tests, Nuclear propulsion, Test equipment, Measurement, Noise analyzers, Machines, Vibration mechanisms, Auxiliary power plants.

Noise and vibration limits for FBM submarine auxiliary machinery are presented. Enclosed also is a review of the application of a type 1551-A sound level meter to evaluate dynamic balance in resilient mounted rotational machinery, and a method to determine the frequency of the vibration body, if a steady state of motion exists. CHAPMAN NUMBERS for auxiliary machinery aboard FBM nuclear class submarines have been plotted from all present existing recorded noise level readings. (Author)

AD-259 335 Div. 31
(10 July 61) OTS price $1.50

Naval Civil Engineering Lab., Port Hueneme, Calif.
PROTOTYPE INFLATABLE CAUSEWAY.
by J. J. Hromadik. 12 June 61, 50p. incl. illus. tables (Technical rept. no. 136)
(Proj. Y-F015-11-315)

Unclassified report

DESCRIPTORS: *Floats, Design, Tests, Construction, Pneumatic devices.

Utilization of an inflatable-type causeway that could be multi-tiered on an LST, or in the well deck of an LSD, is considered to offer a marked logistics advantage over the present type of causeways. A prototype section of such a causeway was designed and fabricated under contract and evaluated by the Laboratory. The causeway section is a steel-decked beam-and-girder framing (analogous to an inverted muffin tin) supported on inflatable pontoon cells restrained in the cavities. Air inflation is achieved by a source external to the system; a limited auxiliary air supply is housed internally for emergency use. Evaluation results indicate that the inflatable system is feasible, but that the prototype unit is too complex for military operations. Retention of the flotation system is advocated, with a recommended redesign of the superstructure. (Author)

AD-259 466 Div. 31
(14 July 61) OTS price $16.00

David Taylor Model Basin, Washington, D. C.
SHIP VIBRATION,
by R. T. McGoldrick. Dec 60, 245p. incl. illus. tables (Rept. no. 1451)

Unclassified report

DESCRIPTORS: *Ship hulls, *Hydrodynamics, *Ships, Vibration, Elasticity, Submarine hulls, Dynamics, Water waves, Pressure, Damping, Vibration mechanisms, Mechanics, Marine propellers, *Marine engineering, Ship plates, Structures, Analog systems, Digital systems, Beams, Model tests, Theory, Submarines, Ship turbines, Design, Partial differential equations.

Details are given on the general subject of ship vibration, including both the structural and hydrodynamic phases of the subject. Brief mention is also made of vibration in the propulsion system. Procedures for dealing with the problem of ship vibration in the design stage are suggested. An introduction to hydroelasticity is included. (Author)

AD-259 651 Div. 31, 30
(17 July 61) OTS price $2.60

David Taylor Model Basin, Washington, D. C.
INSTRUMENTS FOR MEASURING PROPELLER THRUST OSCILLATIONS AND COMPARISON OF TEST DATA FOR TMB MODEL 4521 AND USS SURIBACHI (AE21),
by H. Y. Yeh and Q. R. Robinson. Feb 61, 23p. incl. illus. tables (Rept. no. 1498)

Unclassified report

DESCRIPTORS: *Marine propellers, Model tests, Ship models, *Cargo ships, Naval vessels, *Thrust, Measurement, Thrust meters, Dynamometers, Instrumentation, Oscillation, Wake, Interference, Reflection, Tests.

Results are presented of model tests for evaluating instrumentation developed to predict propeller thrust oscillations produced by nonuniform wake, interference, and reflection. The model test results are compared with results of tests on USS SURIBACHI (AE 21). No definite explanation was advanced for the difference between ship and model test results. Possible contributory causes of the difference are (1) shipboard measurements were made at the end of a long and elastically complicated propeller shaft, (2) scale effect of propeller wake between ship and model, and (3) instrumentation error. (Author)

# Division 32 - MISCELLANEOUS ARTS AND SCIENCES

AD-259 812 Div. 31
(19 July 61) OTS price $9.60

Institute of Engineering Research U. of Calif., Berkeley.
AN APPROXIMATION TO MICHELL'S INTEGRAL IN TERMS OF HULL FORM PARAMETERS,
by Jerry W. Cuthbert. Mar 61, 117p. incl. illus. (Series no. 82, Issue no. 17)
(Contract Nonr-22230)
Unclassified report

DESCRIPTORS: *Ship hulls, Mathematical analysis, Integrals, Integral equations, Series, Numerical analysis, Digital computers, Drag, Gravity.

In order to find parameters most appropriate to the gravitational part of ship resistance, Michell's integral is studied, since this formulation is the only available analytic expression for any part of ship resistance. The procedure consists in approximating Michell's integral by replacing the hull in question with a phantom hull like it with respect to certain parameters. These parameters arise from an intuitively appealing criterion for approximation, a criterion which establishes an order for the introduction of parameters into the calculations. A proof is given of convergence of the phantom hull resistance to the resistance of the subject hull as the number of parameters used becomes infinite. Furthermore, it is proved that the procedure constitutes a high-speed approximation in that an order of approximation subject to a certain maximum error at any speed gives, at most, that same error at any higher speed. (Author)

AD-259 814 Div. 31, 30, 9
(19 July 61) OTS price $3.60

David Taylor Model Basin, Washington, D. C.
THE PERFORMANCE OF A FULLY SUBMERGED PROPELLER IN REGULAR WAVES,
by J. H. McCarthy, W. H. Norley, and G. L. Ober. May 61, 34p. incl. illus. 11 refs. (Rept. no. 1440)
Unclassified report

DESCRIPTORS: *Marine propellers, Water waves, Thrust, Torque, Dynamometers, Motion, Hydrodynamics, Measurement, Analysis, Design, Model tests.

The performance of a 16-in., 6-bladed propeller in waves was determined experimentally, and the records of the time-dependent fluctuating propeller forces are analyzed. Various wave lengths, wave heights, and frequencies of encounter were investigated with the propeller advancing normal to the wave crests at each of two fixed shaft centerline submergences. The results indicate that the orbital velocities of the waves have a significant effect, causing fluctuations of the advance coefficient and corresponding fluctuations of the thrust and torque coefficients. The local advance coefficients have been determined by calculating the mean orbital velocities of the waves in way of the propeller disk from trochoidal wave theory. The thrust and torque coefficients for the propeller when operating below wave crests and wave troughs were plotted against their local advance coefficients, and the results were in good agreement with the open-water characteristic curves for the propeller in uniform flow. It is concluded that the performance of a propeller in waves may be predicted from a quasi-steady state analysis. (Author)

AD-259 919 Div. 31, 30, 9
(24 July 61) OTS price $2.60

David Taylor Model Basin, Washington, D. C.
POWERING PERFORMANCE OF A VENTILATED PROPELLER,
by Richard Hecker. June 61, 22p. incl. illus. tables (Rept. no. 1487)
Unclassified report

DESCRIPTORS: *Marine propellers, Cavitation, Model tests, Thrust, Dynamometers, Measurement, Design, Hydrodynamics, Ventilation, Torque.

In an effort to achieve supercavitating performance at relatively low speeds, ventilation of a supercavitating (SC) propeller was investigated. Tests were run with a two-bladed SC propeller ventilated through holes in the propeller blades. The results of the tests show that ventilated propellers operate with a fully developed cavity at speeds too low for supercavitating operation. Powering performance was found to be dependent upon the cavitation index based on cavity pressure. (Author)

## 32. MISCELLANEOUS ARTS AND SCIENCES

AD-259 195 Div. 32
(10 July 61) OTS price $3.60

Columbia U., New York.
COMPARATIVE STUDY OF PERSONAL AND PERCEIVED NATIONAL IDEOLOGIES.
Rept. on Research on Comparative Impact of Actual Versus Anticipated Events Project Outcomes,
by Charles W. Wheatley. 5 May 61, 32p. incl. illus. tables.
(Contract AF 49(638)743)
(AFOSR-575) Unclassified report

DESCRIPTORS: *Social science, Sociometrics, Culture, *Sociology, *Political science, Mathematical analysis, Mathematical prediction, Economics.

This report is concerned with the problem of how citizens of contemporary societies relate to their countrymen, to their nation, and to other nations in ideological terms. The survey was attempted by requesting that each Finnish and Brazilian legislator and student in the sample designate which from a list future outcomes would be most, next most, least, and next least desired by specific referent nations. The respondent was requested to rate these outcomes for their personal desirability. From these data, indices of ideological orientation were obtained for each respondent group with respect to each nation. Such indices might take values between minus and plus twelve. Subjects were then characterized as being either in agreement of disagreement with their national ideology. The resulting empirical distributions were found to correlate with other central variables of this study, as specified in the body of this report. The approach represented is viewed as an initial step in assessing the ideological constitution of particular nations and their citizenry on a replicable basis. (Author)

AD-259 318 Div. 32, 14, 17
(11 July 61) OTS price $2.00

Ohio State U. Research Foundation, Columbus.
MATERIALS INFORMATION CENTERS.
Rept. for July-Oct 60 on Materials Applications, by K. A. Winter and Irving Lopatin. Feb 61, 67p. (Contract AF 33(616)6288, Proj. 7381; In cooperation with McGraw-Hill Book Co., Inc., New York) (WADD TN 60-246, Supersedes WADC TN 58-192, AD-155 885) Unclassified report

DESCRIPTORS: Scientific research, Industrial research, *Materials, Military research, Scientific reports, *Libraries, Data, Sources, Scientific organizations, *Indexes, Documentation.

The technical note contains a listing of all known organizations or agencies which may be designated as a materials information center on the basis of their activities concerned with the collection and dissemination, in some manner, of information on a class, group, or type of material, or materials. The purpose of this technical note is to provide interested personnel of the Department of Defense, its contractors, and materials suppliers with a means of locating and obtaining information pertinent to their specific area of interest. (Author)

AD-259 508 Div. 32, 30
(12 July 61) OTS price $5.60

Naval Weapons Lab., Dahlgren, Va.
INFORMATION RETRIEVAL AT THE MISSILE SAFETY INFORMATION CENTER.
by R. C. Turner, Jr. 5 July 61, 49p. incl. illus. (NWL rept. no. 1762; Supersedes Technical memo. no. W-4/60 and Rept. no. 1724, AD-245 809) Unclassified report

DESCRIPTORS: *Documentation, Coding, Guided missiles, *Data processing systems, Data storage systems, Mathematical computer data.

Information retrieval is an important function of the Missile Safety Information Center at the Naval Weapons Laboratory, Dahlgren, Virginia. The use of this retrieval system permits rapid and low-cost searching of the publications contained in (or referenced by) the Missile Safety Information Center. The search for discrete information is limited to those characteristics under which each document has been cataloged. The system is comprehensive and flexible. This report includes the categories of information used in the Information Retrieval system, details of the operation, and a description of the codes utilized. This report cancels and supersedes NAVWPNLAB, Dahlgren Technical Memorandum No. W-4/60 dated February 1960, and Report No. 1724, (AD-245 808), dated 27 October 1960. The superseded technical memorandum and report should be destroyed. (Author)

AD-259 817 Div. 32
(19 July 61) OTS price $14.00

National Research Council, Washington, D. C.
GEOGRAPHIC ASPECTS OF PLANTATION AGRICULTURE IN YUCATAN,
by Roland Emanuel Paul Chardon. 1961. 100p. incl. illus. tables, 99 refs. (Publication no. 876)
(Contract Nonr-230009)
(Foreign Field Research Program, ONR rept. no. 11) Unclassified report

DESCRIPTORS: *Agriculture, *Mexico, Geography, Terrain, Production, Economics, Plants, Growth.

The main purpose of this investigation is the study of plantation, from a geographic point of view, in an area which has experienced the changes just described. The region chosen for this study is the State of Yucatan, Mexico, and the agricultural unit under examination is the henequen hacienda, which in this area represents the plantation type. More specifically, this study focusses on the following points: (1) the henequen hacienda as it developed in Yucatan's Henequen Zone, and area commonly accepted as a plantation area, and its place in the general plantation concept; (2) the effects of Mexico's land reform policies on the henequen hacienda and the plantation area; (3) the geographic relationships between plantation and non-plantation types of economic organization in the Henequen Zone; and (4) the factors and conditions extant in the location of both henequen haciendas and the Henequen Zone within Yucatan. (Author)

AD-259 829 Div. 32
(20 July 61) OTS price $11.00

Army Library, Washington, D. C.
DISARMAMENT: A BIBLIOGRAPHIC RECORD 1916 - 1960, by Harry Moskowitz and Jack Roberts. 15 May 60, 1v. Unclassified report

DESCRIPTORS: *Bibliography, *Political science, Armament, *Foreign policy, USSR, *Economics, *Sociolgy.

Contents:
Historical background
League of Nations
Conferences
Washington disarmament conference, 1921-1922
London Naval conferences, 1930, 1935-1936
Disarmament problems and proposed solutions
Economic, political, and sociological aspects
Control and inspection
Nuclear energy and weapons - international control
East-West negotiations
Disarmament efforts in the United Nations
United States and other western powers: Disarmament policies and trends
USSR: Disarmament policies and trends
Eisenhower and Krushchev on disarmament
Bibliographies
Soviet disarmament bibliography
Soviet position on disarmament (A translation of the concluding chapter in - The USSR and the Problem of disarmament, Moscow
A selected chronology of disarmament developments
Disarmament activities in the United Nations
The techniques of Soviet negotiation
Soviet treaty violations, A 40-Year record of broken promises
Selected Soviet statements on world peace, arms control, and disarmament

## 33. TRANSPORTATION

AD-259 951 Div. 33
(21 July 61) OTS price $5.60

Airborne Instruments Lab., Inc., Deer Park, Long Island, N. Y.
STUDY OF MOBILE LOUNGE AND OTHER APRON TRAFFIC

# Division 33 - TRANSPORTATION

DELAYS AT WASHINGTON DULLES INTERNATIONAL AIRPORT,
by W. J. Offutt. Jan 61, 51p. incl. illus. table.
(Contract FAA/BRD-136)

Unclassified report

DESCRIPTORS: *Airports, *Traffic, Vehicles, *Passenger vehicles, Mobile, Mathematical analysis, Design, Control, Runways, Control systems.

An analysis of mobile-lounge traffic and service-vehicle traffic on the Dulles International Airport ramp is presented. Mathematical models were used that were developed under the previous phase of this contract and reported in Airport Runway, Taxiway, and Ramp Design. Vehicle operation and taxiing aircraft characteristics were observed at Idlewild Airport. The results of the analysis indicate that there will be no appreciable delays for either mobile lounge or other vehicular traffic in crossing the taxi lanes in the aircraft-parking ramp areas. In addition, it is recommended that a semi-automatic control system be considered for controlling the vehicular traffic crossing the aircraft-parking ramp area. A three-phase construction program is proposed to keep pace with the stages in the airport's development. (Author)

AD-259 960 Div. 33
(24 July 61) OTS price $5.00

Human Sciences Research, Inc., Arlington, Va.
A SURVEY OF LOCAL ORIGINS AND DESTINATIONS OF USERS OF WASHINGTON NATIONAL AIRPORT. APPENDIX B. (AIRPORT TRANSPORTATION - A STUDY OF TRANSPORTATION MEANS BETWEEN AIRPORTS AND THE METROPOLITAN AREAS THEY SERVE)
Appendix B to the Final rept.
by John P. Robinson and Peter G. Nordlie.
Feb 61, 69p. incl. illus. tables (Rept. no. HSR-RR-61/5-MS-b)
(Contract FAA/BRD-203)

Unclassified report

DESCRIPTORS: *Airports, *Transportation, Analysis, *Air traffic.

AD-259 962 Div. 33
(24 July 61) OTS price $5.00

Human Sciences Research, Inc., Arlington, Va.
AIRPORT TRANSPORTATION. A STUDY OF TRANSPORTATION MEANS BETWEEN AIRPORTS AND THE METROPOLITAN AREAS THEY SERVE,
by Peter G. Nordlie, R. Popper and others.
Feb 61, 331p. incl. illus. tables, 461 refs.
(Rept. no. HSR-RR-61/5-MS)
(Contract FAA/BRD-203)

Unclassified report

DESCRIPTORS: *Airports, *Transportation, Analysis, *Air traffic.

AD-259 989 Div. 33
(24 July 61) OTS price $1.10

Naval Civil Engineering Lab., Port Hueneme, Calif.
EVALUATION OF M-9M2 AIRFIELD LANDING MAT,
by T. J. Garcia. 10 May 61, 6p. illus. (Technical note no. N-413)

Unclassified report

DESCRIPTORS: *Landing mats, *Runways, Tests, Acceptability, Trafficability.

Limited tests were conducted on twelve panels of the Modified M-9M2 airfield landing mat on dry unstabilized beach sand to evaluate the ease of handling, assembly and disassembly, and its performance under vehicular loads and traffic. The handling of the twelve panels on the shipping skid pallet with a pneumatic-tired forklift or towing with a light military vehicle on dry sand was not feasible. It appeared during assembly and disassembly that two semi-skilled men were ableto handle a panel (162.5 lbs) without complication or undue strain. Truck loads up to approximately 39,500 pounds caused no visible damage to the individual panels or panel connectors. No difficulty was encountered during disassembly and reassembly after many passes of truck loads. Periodic observations of the assembled mat section over a period of six months revealed that military and construction type vehicles caused no damage to the panels. On one occasion, however, a heavy crawler type tractor caused damage to some of the connectors on one of the panels. (Author)

# NON-MILITARY AND OLDER MILITARY RESEARCH REPORTS

* Descriptors marked with an asterisk will be included in the cumulative indexes.

## ASTRONOMY

PB 154 783 $1.10

[Steward Observatory, Tuscon, Ariz.]
SOLAR SYSTEM, VOLUMES III-V, by Gerard P. Kuiper and Barbara M. Middlehurst, eds. Progress rept. no. 7 on Contract AF 19(604)5193. 13 Feb 61, 10p.

DESCRIPTORS: *Solar systems, Theory, Planets, Satellites.

These volumes are intended to collect and evaluate the principal empirical data and theoretical concepts concerning the planets and the smaller bodies of the solar system.

## BEHAVIORAL SCIENCES

PB 157 227 $3.60

[Armed Services Technical Information Agency, Arlington, Va.]
HUMAN ENGINEERING; A SELECTED BIBLIOGRAPHY AND A GUIDE TO THE LITERATURE. Rev. edition. Aug 53, 35p. 395 refs. Rept. no. ARC 426U; AD-16 709.

This report released for sale to the public 4 Aug 61.

DESCRIPTORS: *Human engineering, Bibliography, Psychometrics, Psychology, *Military psychology, Memory, Learning, Transfer of training, Emotions, Reaction time, Motor reactions, Perception, Vision, Hearing, Behavior, Sleep.

PB 171 898 $1.50

Lockheed Aircraft Corp., Sunnyvale, Calif.
AUTOMATED TEACHING MACHINES. AN ANNOTATED BIBLIOGRAPHY, by Alfred A. Beltran. Nov 60, 54p. 82 refs. Special Research Bibliography SRB-60-6; AD-249 924.

DESCRIPTORS: *Training devices, Automation, *Bibliography, Education.

Beginning with a summary on the early literature on teaching devices, this annotated bibliography is concerned with teaching machines in the broad sense. It covers devices from simple punchboards to complicated computer controlled machines capable of providing a four year college course in one year. (Author)

### Psychology

PB 155 332 $1.60

Air Force Missile Development Center, Holloman AFB, N. Mex.
A THEORY CONCERNING THE DEVELOPMENT OF AN INSTRUMENTAL SEQUENCE IN THE CHIMPANZEE, by Frederick H. Rohles, Jr. Mar 61, 20p. 7 refs. AFMDC-TR-61-4; AD-254 570.

DESCRIPTORS: *Motor reactions, *Learning, Primates, Behavior, Theory.

This report describes the performance of a chimpanzee on a three-stimulus oddity problem with fixed ratio reinforcement. A theory to account for the development of this behavior is presented. (Author)

PB 157 164 $2.60

City Coll. of the City of New York.
THE ACCEPTANCE OF NEW REFERENCE GROUPS, by Ruth E. Hartley. Technical rept. 2 on Contract Nonr-1597(01). 15 Nov 56, 27p. 13 refs. AD-122 103.

This report released for sale to the public 3 Aug 61.

DESCRIPTORS: Students, *Group dynamics, Theory, Statistical analysis.

Contents:
Generality and projectivity
Stereotypes of group members
Self-evaluation and evaluation of others

PB 157 163 $3.60

City Coll. of the City of New York.
THE ACCEPTANCE OF NEW REFERENCE GROUPS. EXPLORATORY PHASE: FEBRUARY-NOVEMBER, 1955, by Ruth E. Hartley. Annual technical rept. 1 on Contract Nonr-1597(01). 15 Nov 55, 36p. 4 refs. AD-84 343.

This report released for sale to the public 3 Aug 61.

DESCRIPTORS: Students, *Group dynamics, Theory, Statistical analysis.

PB 154 740 $13.00

Courtney and Co., Philadelphia, Pa.
RESEARCH APPROACH TO THE NAVAL OFFENDER PROBLEM IN THE U. S. NAVY, by Douglas Courtney and Nyles W. Jones, Jr. Final rept. on Contract Nonr-2845(00). 15 May 60, 184p. 329 refs. Rept. no. 34; AD-246 225.

DESCRIPTORS: *Naval personnel, *Criminology, Courts martial, Selection, Recruiting, Behavior, Statistical analysis, Personality, Attitudes, *Adjustment (Psychology), Leadership, Bibliography.

Contents:
The roots of the Naval offender problem in civilian life
  Variables affecting delinquency
    Definition of juvenile deliquency
    Pathology as a variable
    Education as a variable
    Previous court records as a variable
    Age as a variable
  Identification of juvenile delinquency
  Prediction of delinquency
  Attitude toward military service
Military offender research and the significant variables resulting from it
  The cost of military unadaptability, i.e., the nature of the problem
  Research studies specific to military offenders
    Psychiatric screening
    Camp Elliott research
    Restoration
A longitudinal approach to Naval offender data
  A critical examination of currently available Naval offender data
Proposed research designs toward solution of the problem
Selected bibliography

PB 155 776 $9.10

Duke U. Medical Center, Durham, N. C.
PSYCHOPHYSIOLOGICAL MECHANISMS OF STRESS RESPONSIVITY, by Sanford I. Cohen, Albert J. Silverman, and B. M. Shmavonian. Annual rept. no. 2, Apr 59-Apr 60, on Contract AF 49(638)354. [1960] 105p. AFOSR TN-60-1178.

DESCRIPTORS: *Reaction (Psychology), *Sensory perception, *Stress (Psychology), *Stress (Physiology), Physiology, Perception.

Contents:
Summary of psychophysiological responses to a "low sensory input" environment; Introductory comments; Physiological and endocrinological measures; Psychological measures; Relationship of catechol amine levels and vascular indices; Catechol amine levels and psychological indices; Relationship of catechol amine levels, psychological discomfort and central nervous system activity; Relationship between nonspecific skin resistance changes, adrenaline levels and peripheral vascular activity; The development of a "predictive" psychological test battery; Psychological survey of Air Force R. O. T. C. subject population; Relationship of psychological and endocrinological variables to the response to an isolated, low sensory input experimental environment; Remarks on general significance of research to the Air Force; Summary of research completed, in progress, and plans for the future; Activities of the staff of the division of psychophysiological research. (See also PB 152 837)

PB 155 225 $1.60

Human Factors Research, Inc., Los Angeles, Calif.
SUBJECTIVE REACTIONS OF VIGILANCE PERFORMERS, by James J. McGrath. Supplementary note to technical repts. 2 and 4 on Human Factor Problems in Anti-Submarine Warfare, Contract Nonr-2649(00). May 60, 12p. 3 refs. AD-252 150.

DESCRIPTORS: *Attention, *Reaction (Psychology), Visual signals, Auditory signals, Behavior, Tests, *Detection, Watches (Nautical).

PB 157 144 $2.60

Kenyon Coll., Gambier, Ohio.
RATE OF SPEAKING: I. RELATIONSHIP BETWEEN ORIGINAL AND REPEATED PHRASES, by Charles Lightfoot. Rept. on Contract N7onr-411, T.O. 1. 10 May 48; 30p. 3 refs. Rept. 411-1-1; ATI-26 672.

This report released for sale to the public 2 Aug 61.

DESCRIPTORS: *Speech, Intelligibility, Conditioned reflex, Reaction (Psychology).

Three related experiments were designed to discover what relationship might obtain between the rate of saying a phrase (stimulus) and rate of repeating that phrase (response) under three conditions: (1) when several groups of phrases are originated by a single speaker who uses a different rate for each group, (2) when a number of phrases are originated by a single speaker who varied his rate from phrase to phrase, (3) when each of several groups of phrases is originated by a different speaker who speaks at his usual rate. On the basis of Fisherian analysis of the data, the following conclusions seem to be indicated for the population sampled: (1) there is a positive relationship between duration of original and repeated phrases under all three conditions. (2) The relationship is not rectalinear when stimuli include phrases presented at a very slow rate. (3) The same sort of relationship does not prevail for all three conditions whether stimulus rates are within the range commonly found among speakers or whether extremely slow rates are used. (4) Response rate is also influenced by factors other than stimulus rate.

PB 153 759 $2.60

National Training Labs., Washington, D. C.
DEFENSE LEVEL AND INFLUENCE POTENTIAL IN SMALL GROUPS, by Jack R. Gibb. Technical rept. no. 6 on Factors Determining Defensive Behavior Within Groups, Contracts Nonr-1147(03), Nonr-2285(01) and Nonr-3088(00). Mar 60, 26p. 13 refs. AD-247 389.

DESCRIPTORS: *Group dynamics, Leadership, Behavior, Sociometrics.

Illustrations from a program of studies are presented which have indicated a possible approach to the study of influence. The studies illustrate the profitability of using a mediating unitary construct such as defensiveness in attempting to predict the influence potential of group-member acts. The defense level in a small group has been shown to be correlated with three empirical influence-related variables: (1) the role repertoire of the individual, (2) the role boundary prescribed by the group, and (3) the consonance of the influence attempt with the group goal system. Evidence

is presented that leaders or group members can engage in activities that have a direct influence upon the defense level of the group. The practical applicability of such findings is obvious. A series of specific alternatives are open to administrators, teachers, therapists, trainers, and parents who wish to increase the induction strength of influence attempts. (Author)

PB 156 729 $1.60

School of Aviation Medicine [Brooks AFB] Tex.
CONSPICUITY OF FLASHING A STEADY LIGHT SIGNAL. II. HIGH CONTRASTS, by Siegfried J. Gerathewohl. Feb 52, 11p. 6 refs. Proj. no. 21-24-014, rept. no. 2; ATI-152 956.

This report released for sale to the public 1 Aug 61.

DESCRIPTORS: *Signal lights, Brightness, *Vision, Psychology, Physiology, Tests, Lighting systems, Pilots, Approach lights, Runway lights, Instrument panels.

Multiple complex reaction experiments were conducted at contrast ratios of 1031.6, 138.9, 19.0, 18.3, and 6.6. It was found that, when the subject is not familiar with the test situation, steady light signals are more conspicuous than flashing light signals. On the basis of both the numerical results and the observation of subjects, it was concluded that the conspicuity of signals depends on physical, physiological, and psychological factors which determine the conspicuity thresholds for the two types of light. These findings indicate that for practical purposes the factors of brightness contrast, time, and attention must be considered. (Author) (See also PB 104 301)

## BIOLOGICAL SCIENCES
### Anatomy and Physiology

PB 156 786 $11.50

Air Crew Equipment Lab., Naval Air Material Center, Philadelphia, Pa.
ENVIRONMENTAL REQUIREMENTS OF SEALED CABINS FOR SPACE AND ORBITAL FLIGHTS. A BIBLIOGRAPHY OF PSYCHOPHYSIOLOGICAL STUDIES RELEVANT TO SPACE AND ORBITAL FLIGHTS, by Neal M. Burns, Ralph B. Ziegler and others. 26 Oct 60, 159p. 582 refs. NAMC-ACEL-441; AD-246 414.

DESCRIPTORS: *Space flight, *Space medicine, *Bibliography, Physiology, Psychology, Space capsules, *Spaceship cabins, Aviation personnel, Motor reactions Stress (Physiology), Stress (Psychology), Diet, Perception, Behavior, Satellite vehicles, Orbital flight paths.

A bibliography is presented of psychological, physiological, and environmental reports pertinent to man's role in space and orbital flight. Five hundred and eighty-two entries are provided on 3 x 5 inch file card forms with the content of the report indicated by the category into which it is placed. The literature review for this bibliography was completed in April 1960. (Author)

PB 156 736 $6.60

Naval School of Aviation Medicine, Pensacola, Fla.
SOME EFFECTS OF EXPLOSIVE DECOMPRESSION ON ALBINO RATS: PRELIMINARY STUDIES, by Arthur L. Hall. 10 Aug 55, 70p. 68 refs. Proj. rept. no. NM 001 101 105.01.

This report released for sale to the public 1 Aug 61.

DESCRIPTORS: *Explosive decompression, *Decompression sickness, Rats, Aviation medicine, Physiology, *Pressure breathing, Anoxia.

Albino rats were explosively decompressed over various rates of times and ranges of pressure. Rats decompressed slowly were used as controls. Explosive decompression per se produced damage most apparent in the pulmonary system. Some instances of damage to the gastrointestinal tract, ears, or diaphragm were noted. (Author)

PB 157 177 $1.60

School of Aviation Medicine [Brooks AFB] Tex.
THE MYOGLOBIN CONTENT OF VARIOUS RAT TISSUES AS AFFECTED BY ALTITUDE AND EXERCISE, by Dominic Criscuolo and Robert C. Clark. Dec 55, 15p. 9 refs. Rept. 55-84; AD-90 762.

This report released for sale to the public 4 Aug 61.

DESCRIPTORS: *High altitude, *Exercise, *Myoglobin, Tissues (Biology), Rats, Muscles, Heart, Physiology.

Rats chronically exposed to 20,000 feet simulated altitude showed an increase in myoglobin content of the heart, diaphragm, and gastrocnemius muscles. Exercise did not materially affect this increase. The increase was noted early in the period of acclimatization about the fourth and fifth weeks; then the values returned to normal at the end of the tenth week. Rats reared at altitude showed about the same myoglobin content as the chronically exposed rats at the tenth week. (Author)

### Radiobiology

UCLA-475 $2.60

California U., Los Angeles, School of Medicine.
INFLUENCE OF CHELATES ON THE AVAILABILITY OF FISSION PRODUCTS TO PLANTS GROWN IN A CONTAMINATED SOIL, by E. Essington, H. Nishita, and A. Wallace. Rept. on Contract AT(04-1)-GEN-12. 5 June 61, 27p.

UCLA-479 $2.60

California U., Los Angeles. School of Medicine.
MECHANISM FOR THE TRANSFORMATION OF FERRIPROTOPORPHYRIN BY A $Co^{60}$-$\gamma$-RAY INITIATED CHAIN REACTION, by Mary-Louise Rothschild. Rept. on Contract AT(04-1)-GEN-12. 23 June 61, 27p.

UCLA-476 $1.60

California U. Los Angeles, School of Medicine,
STUDIES OF THE TRANSMISSION OF MOUSE LEUKEMIA WITH PURIFIED NUCLEIC ACID PREPARATIONS, by E. F. Hays. Rept. on Contract AT(04-1)-GEN-12. 6 June 61, 16p.

TID-13109 $2.60

Colorado Dept. of Game and Fish, Denver.
EXPERIMENTS ON THE UPTAKE OF RADIOACTIVE PHOSPHOROUS FROM THE WATER AND FROM A SINGLE ORAL DOSE BY BROOK AND RAINBOW TROUT, by W. C. Nelson. 3 Jan 61, 22p.

TID-13108 $4.60

Colorado State U. Fort Collins, and American Inst. of Biological Sciences, Washington, D. C.
THE USE OF RADIOPHOSPHOROUS IN DETERMINING FOOD CHAIN RELATIONSHIPS IN THE AQUATIC ENVIRONMENT, by D. A. Hoffman & J. R. Olive. Final rept. on Contract AT(11-1)-398. [1960] 46p.

HW-30340 $2.60

Hanford Atomic Products Operation, Richland, Wash.
EFFECT OF BODY DISTRIBUTION AND RETENTION OF TRITIUM ON THE HAZARD OF EXPOSURE TO TRITIUM OXIDE, by R. C. Thompson. Rept. on Contract W-31-109-eng-52. 1 Jan 54, 29p.

UCRL-9688 $0.75

Lawrence Radiation Lab., U. of California, Berkeley.
PREPARATION OF BIOLOGICAL MATERIAL FOR RADIOAUTOGRAPHIC STUDIES OF INTERMEDIARY METABOLISM, by V. Moses. Rept. on Contract W-7405-eng-48. May 61, 29p.

TID-13090 $2.60

Michigan U, Ann Arbor.
TUMOR IMMUNOLOGY, by W. J. Nungester. Final rept. 1 Feb 53-31 Jan 61, on Contract AT(11-1)-70, Proj. 9. 21p.

PB 157 168 $1.60

Naval School of Aviation Medicine, Pensacola, Fla.
TISSUE DEPTH DOSES IN THE HIGH INTENSITY PROTON RADIATION FIELD OF THE INNER VAN ALLEN BELT, by Hermann J. Schaefer. 10 Nov 59, 15p. 6 refs. Research Proj. MR005.13-1002 (Formerly NM 12 01 11). Subtask 1, rept. no. 16; AD-230 337.

This report released for sale to the public 2 Aug 61.

DESCRIPTORS: *Tissues (Biology), *Radiation effects, *Protons, Dosage, Ionization, *Van Allen radiation belt, Space flight, Hazards, *Radiation hazards.

The energy spectrum of the proton radiation field in the inner Van Allen Belt at 1230 km altitude has been established by Freden and White on the basis of nuclear emulsion recordings. These data are evaluated in terms of tissue depth doses for a human target. The extreme heterogeneity of the radiation is demonstrated by deriving the differential range spectrum and by investigating the effect of prefiltration. For a spherical tissue target of 52 cm diameter (75 kg) behind a shield of 2 g/cm$^2$ an entrance dose rate of 0.23 rep/hour and a depth dose in the center of 0.10 rep/hour are found. Extrapolation to the center of the inner belt at 3000 km leads to an entrance dose of 130 rep/hour. (Author)

TID-12800 $4.60

Noyes Lab., U. of Illinois, Urbana.
CARBON-13 KINETIC ISOTOPE EFFECTS IN THE UREASE-CATALYZED HYDROLYSIS OF UREA. I. TEMPERATURE DEPENDENCE, by K. R. Lynn and P. E. Yankwich.

ORO-375 $1.75

Tennessee U Research Lab., Oak Ridge.
SEMI-ANNUAL PROGRESS REPORT FOR 1 JULY 60-31 DECEMBER 1960 on Contract AT-40-1-GEN-242. June 61, 75p.

## CHEMISTRY

PB 155 823 $2.60

New York U. Coll. of Engineering, N. Y.
BARIUM LITERATURE SURVEY, by Charles J. Marsel and Walter Brenner. Scientific rept. no. 4, 1 Sep 59-15 Mar 60, on Research on the Preparation of Pure Metals, Contract AF 19(604)4124. [1960] 28p. 27 refs. AFCRL-126; AD-254 786.

DESCRIPTORS: *Barium, Barium compounds, Synthesis, Physical properties, Preparation, Chemical properties, Separation, Calcium, Strontium, Alkali metals, Organic compounds, Hydrides, Alkaline earth metals, Solubility, Chromotographic analysis, Ion exchange, Bibliography.

Literature surveys were made in preparation for an experimental study directed toward the production of high purity Ba metal. The pertinent physical and chemical properties of Ba metal and the principal Ba compounds (organic and inorganic) are summarized. Fifteen inorganic and 8 organic compounds are discussed. A comprehensive survey was made of methods for separation of Ba from Ca and Sr. The principal methods for the preparation of Ba metal include fused salt electrolysis and reduction of Ba compounds such as the oxide with Al, Mg, Si and their compounds or alloys in vacuo. No good methods for the separation of Ba from Ca and Sr were reported. A bibliography on the separation of Ba from Ca and Sr is presented which includes 9 chemical, 6 chromatographic, and 5 ion exchange methods.

IDO-14546 $0.50

Phillips Petroleum Co., Idaho Falls.
STEAM STRIPPING TBP-AMSCO SOLUTIONS FROM NON-VOLATILE CONTAMINANTS, by C. R. Ford and H. V. Chamberlain. Rept. on Contract AT(10-1)-205. 12 May 61, 17p.

## Inorganic Chemistry

IDO-16674 $0.50

Phillips Petroleum Co., Idaho Falls.
THERMAL STABILITY OF GADOLINIUM NITRATE SOLUTION AT HIGH TEMPERATURE, by J. F. Koenig. Rept. on Contract AT(10-1)-205. 19 May 1961, 5p.

PB 156 833 $1.60

Rensselaer Polytechnic Inst., Troy, N. Y.
A DYNAMIC METHOD FOR THE DISSOCIATION PRESSURES OF CARBONATES, by George J. Janz and Max R. Lorenz. Technical rept. no. 6 on Contract Nonr-591(10). Aug 60, 13p. 16 refs. AD-244 946.

DESCRIPTORS: *Carbonates, Stability, Decomposition, *Thermochemistry, Test methods, Pressure.

The thermal dissociation of carbonates have in general been investigated by a static method in which the $CO_2$ pressure developed in a sealed system is taken as the equilibrium pressure. This note describes a dynamic method particularly well suited for a rapid survey of the dissociation pressures and thus the thermal stability of compounds, such as carbonates, where one of the products is gaseous. The essential feature of the dynamic method is the thermogravimetric principle of weight loss or gain of $CO_2$ as a function of temperature and partial pressure of $CO_2$. (Author)

PB 156 860 $1.60

Rensselaer Polytechnic Inst., Troy, N. Y.
MOLTEN CARBONATES. PART IV. SURFACE TENSIONS FOR $Li_2CO_3$, $Na_2CO_3$ AND Na, K/$CO_3$ MIXTURES, by George J. Janz and Max R. Lorenz. Technical rept. no. 8 on Contract Nonr-591(10). Aug 60, 10 refs. AD-245 100.

DESCRIPTORS: *Carbonates, *Alkali metal compounds, Lithium compounds, Sodium compounds, Potassium compounds, Mixtures, *Surface tension, Melting, *Surface properties.

The surface tensions for molten $Li_2CO_3$, $Na_2CO_3$, $K_2CO_3$ and a series of $Na_2CO_3$-$K_2CO_3$ mixtures have been carefully investigated and are reported over a wide range of temperature. The data fit a linear relation: $\gamma = \gamma_0 - a\,t$, and the parameters are reported. Comparison of the surface tensions for these and a series of molten halides at temperatures 10% above the respective melting points is given. The variation of the surface tension with change in anionic and cationic radius is examined in the light of the ionic nature of such liquids. The results for the $Na_2CO_3$-$K_2CO_3$ mixture are compared with a theoretical prediction by the Guggenheim equation. Strong ionic interactions in this mixture are not anticipated by this criterion. (Author)

PB 156 835 $1.60

Rensselaer Polytechnic Inst., Troy, N. Y.
MOLTEN CARBONATES. V. DENSITIES AND MOLAR VOLUMES FOR $Li_2CO_3$, $Na_2CO_3$, $K_2CO_3$ AND $Na_2CO_3$-$K_2CO_3$ MIXTURES, by George J. Janz and Max R. Lorenz. Technical rept. no. 9 on Contract Nonr-591(10). Aug 60, 9 refs. AD-245 691.

DESCRIPTORS: *Carbonates, *Alkali metal compounds, Lithium compounds, Sodium compounds, Potassium compounds, Mixtures, *Density, Volume, Melting, Liquids, Molecules.

Precise values for the densities of $Li_2CO_3$, $Na_2CO_3$, $K_2CO_3$, and mixtures have been determined over a wide temperature range. For the pure salts and mixtures, the densities and molar volumes are found linear with temperatures. The parameters of the equations are reported. It appears from the small deviations from the principle of additivity of molar volumes that these mixtures are very nearly ideal liquids. Interpretation of the limited deviations as due to interactions electrostatic in nature because of the asymmetrical force fields in these mixtures rather than due to complex ion species is suggested. (Author) (See also PB 156 860)

PB 156 836 $2.60

Rensselaer Polytechnic Inst., Troy, N. Y.
MOLTEN CARBONATES. PART VI. ELECTRICAL CONDUCTANCES OF $Li_2CO_3$, $Na_2CO_3$ AND $K_2CO_3$, by George J. Janz and Max R. Lorenz. Technical rept. no. 10 on Contract Nonr-591(10). Aug 60, 24p. 18 refs. AD-245 823.

DESCRIPTORS: *Carbonates, *Alkali metal compounds, *Electrical conductance, Lithium compounds, Sodium compounds, Potassium compounds, Melting, Electrochemistry.

The electrical conductances of $Li_2CO_3$, $Na_2CO_3$, and $K_2CO_3$ have been determined from the melting points up to 1000 degrees C under a $CO_2$ atmosphere and with careful attention to experimental features capable of precise measurements with molten carbonates. The equation for the temperature dependence of the equivalent conductance for these salts are: $Li_2CO_3$ (740 to 845 degrees C), lambda equals 755.3 exp-4400/RT; $Na_2CO_3$ (865 to 970), lambda equals 485.2 exp-4140/RT; and $K_2CO_3$ (910 to 1010), lambda equals (541.6 exp-4640/RT) (ohm-sq cm-equiv). The results are examined together with the data for the alkali halides and related molten salts. The differences noted support the view that in molten carbonates, the carbonate ions contribute more predominantly than the M+ species to electrical transport in the process of conductance. (Author) (See also PB 156 835)

## Organic Chemistry

PB 152 879 $2.60

Noyes Chemical Lab., U. of Illinois, Urbana.
THE DETERMINATION OF DOUBLE-BOND CHARACTER IN CYCLIC SYSTEMS. V. PROTON CHEMICAL SHIFTS IN CHELATED DERIVATIVES OF BENZENE, NAPTHALENE AND PHENANTHRENE, by A. L. Porte, H. S. Gutowsky, and I. Moyer Hunsberger (Fordham U.). Technical rept. no. 26 on Contract Nonr-1834(13). 27 Jan 60, 25p. 15 refs. AD-234 562.

DESCRIPTORS: *Chelate compounds, *Benzenes, *Naphthalenes, *Phenanthrenes, *Phenols, *Alcohols, *Chemical bonds, Protons, Aldehydes, Ketones, Esters, Methyl radicals, Nuclear magnetic resonance, Hydroxides.

The OH proton chemical shifts are measured for phenol, β-naphthol, 9-phenanthrol, and for chelated o-substituted derivatives of each containing an aldehyde, methyl ketone and methyl ester group. The large amounts ($\Delta\delta$) by which the shifts to lower applied fields are greater in the chelated derivatives than in the parent phenols are measures of the strengths of the intramolecular hydrogen bonds and are proportional to the bond multiplicity of the ring bonds between the carbon atoms holding the chelated substituents. The $\Delta\sigma$ values are also proportional to $\Delta\nu$(C = 0) values determined earlier from infrared spectra of the same compounds. Mechanisms responsible for the proton chemical shifts are discussed. (Author)

PB 152 878 $4.60

Pennsylvania State U. Coll. of Chemistry and Physics, University Park.
SIGMA VALUES FROM REACTIVITIES. A SUMMARY OF SOME OF THE DEVELOPMENTS FROM THE DECADE, 1950-1960, by Robert W. Taft, Jr. Technical rept. no. 24 on Contract Nonr-656(05). Jan 60, 46p. 36 refs. AD-232 229.

DESCRIPTORS: *Electrons, Distribution, *Chemical reactions, Organic compounds, *Substitution reactions, Theory.

Presented as a part of the Symposium on Electric Distributions in Organic Molecules at the Atlantic City Meeting of the American Chemical Society, September, 1959.

## Physical Chemistry

WAPD-TN-204 $0.75

Bettis Atomic Power Lab., Pittsburgh, Pa.
THE BEHAVIOR OF ELECTROLYTIC SOLUTIONS AT ELEVATED TEMPERATURES AS DERIVED FROM CONDUCTANCE MEASUREMENTS, by J. M. Wright, W. T. Lindsay, Jr. and T. R. Druga. Rept. on Contract AT-11-1-GEN-14. June 61, 34p.

PB 155 515 $11.50

Electronic Systems Lab., Mass. Inst. of Tech., Cambridge.
OPTIMAL OPERATION OF A FIXED BED CYCLIC ADIABATIC REACTOR, by Thomas J. Boyle, Master's thesis. Rept. on Contract DA 19-020-ORD-4637. Sep 60, 153p. 14 refs. Rept. 7967-R-6; OOR rept. 2001:5-E; AD-252 499.

DESCRIPTORS: *Butanes, *Butadienes, *Catalysts, Simulation, *Dehydrogenation, Computers, Chemical reactions, Synthesis, Production, Calculus of variations.

In the commercial dehydrogenation of butane to form butadiene, a cyclically operated fixed-bed adiabatic reactor is employed. Throughout the ten-minute reaction period the reactor catalyst bed undergoes a thermal transient in which the temperature drops about 100 F. This study had as its objective the determination of the feed flow rate as a function of time during the reaction cycle that maximizes the profit of the operation. Two formulations of the problem are presented, differing in the accuracy of representation of the physical system. The optimum flow variation is obtained both by the calculus of variations and dynamic programming. It is shown that the optimum variation in flow gives an increase in the profit of the cycle of only one percent relative to operation at constant flow rate. (Author)

PB 156 740 $6.60

Flight Research Lab., Wright Air Development [Div.] Wright-Patterson AFB, Ohio.
STUDIES ON BURNER FLAMES OF HYDROGEN-OXYGEN MIXTURES AT HIGH PRESSURES, by Rudolph Edse. Final rept. on Mechanism and Kinetics of Hydrogen Combustion. Apr 52, 68p. 13 refs. WADC Technical rept. 52-59; ATI-159 412.

This report released for sale to the public 1 Aug 61.

DESCRIPTORS: *Hydrogen, *Oxygen, *Flames, Combustion, Turbulence, High pressure research, Mixtures.

A new apparatus for the study of bunsen burner flames at pressures up to 100 atmospheres is described. With hydrogen-oxygen mixtures the flames at elevated pressures are always turbulent unless burner tubes with an inner diameter much smaller than 0.03 cm are used. The flash-back conditions of turbulent hydrogen-oxygen flames at atmospheric pressure and at 14.6 atmospheres are given by the critical velocity gradient at the wall of the burner tube. The temperature of the burner tip has a large effect on the flash-back tendency of the flame. For turbulent flames the critical flash-back gradient is larger than for laminar flames. The limit between stable flame and flash-back was found to be very sharp. From measurements of the flame pressures and from photographs of the flame cones it is concluded that the burning velocity of turbulent flames is not larger than that of laminar flames. Depending on the mixture ratio the burning velocities of hydrogen-oxygen flames at 14.6 atmospheres are 2 to 3 times as large as those of atmospheric flames. From a theoretical consideration it is concluded that the burning velocities of hydrogen-oxygen flames increase with pressure because the flame temperatures increase with pressure, and thus also the heat conduction from the burning zone into the unburned gas.

HW-68003(Rev) $0.50

Hanford Atomic Products Operation, Richland, Wash.
SELECTIVE REDUCTION OF PLUTONIUM(VI) TO PLUTONIUM(IV) IN A PLUTONIUM(IV-VI) NITRIC ACID SOLUTION, by M. H. Campbell. Rept. on Contract AT(45-1)-1350. Feb 61, 11p.

PB 171 918 $0.75

Illinois U., Urbana.
A STUDY OF ADSORPTION ON MERCURY BY DOUBLE LAYER CAPACITY MEASUREMENTS. PART I. ADSORPTION AT EXPANDING AND RECEDING MERCURY SURFACES. PART II. BEHAVIOR OF MONOLAYER PALMITIC ACID ON MERCURY-COATED PLATINUM ELECTRODES, by H. A. Laitinen and K. Morinaga. Rept. on Surface and Interface Phenomena of Matter, Contract AF 33(616)5446. Sep 60, 27p. 19 refs. ARL Technical note 60-129; AD-249 453.

DESCRIPTORS: *Mercury, *Surface properties, *Electrodes, Capacitors, Adsorption, Measurement, *Mercury electrodes, Films.

From the double-layer capacity measurements of surface-active substances with an expanding and receding mercury electrode, it was found that though a compressed adsorbed film might be formed by receding a mercury surface, as an intermediate state immediately after a recession, it was too unstable to exist for more than one minute and changed very rapidly into the same stable film as observed in expansion, which might be considered to correspond to an equilibrium state. A multimolecular adsorbed layer is formed at a mercury-solution interface in the saturated solution of n-nonanoic (n-pelargonic) acid. Experimental conditions were found under which a mercury-coated platinum electrode can be prepared reproducibly with the same double-layer properties as pure mercury. An oriented monolayer film of palmitic acid can be formed on such a mercury-coated platinum electrode by applying the Langmuir-Blodgett technique. Such a monolayer film of palmitic acid was found not so stable at a mercury-solution interface as at an air-solution interface and the molecules of palmitic acid diffused away very slowly from the electrode surface to the bulk of the solution. The differential capacity of the oriented monolayer of palmitic acid on a mercury-coated platinum electrode was found 4.3 uf/sq cm in 0.1 M Sodium Chlorate at -0.6 volt vs. S. C. E., the potential of maximum stability of the adsorbed monolayer. (Author)

IS-293 $1.60

Institute for Atomic Research, Iowa State U., Ames.
CHLOROTRIAMMINEPLATINUM(II) ION. ACID HYDROLYSIS AND ISOTOPIC EXCHANGE OF CHLORIDE LIGAND, by F. Aprile and D. S. Martin, Jr. [1961] 15p.

TID-13056 $1.60

Kedzie Chemical Lab., Michigan State U., East Lansing, Mich.
THE COMPLEXES OF SOME 5-SUBSTITUTED TETRAZOLES WITH NICKEL (II), by N. A. Daugherty and C. H. Brubaker, Jr. [1960] 10p.

UCRL-9602 $1.25

Lawrence Radiation Lab., U. of California, Berkeley.
THE ELECTRON SPIN RESONANCE ABSORPTION OF TWO SOLID-STATE PARAMAGNETIC CENTERS. PART I. FROZEN "TETRAMETHYL AMMONIUM" SOLUTIONS. PART II. CRESTMORE BLUE CALCITE, by L. R. Doyle. Rept. on Contract W-7405-eng-48. 10 Mar 61, 55p.

PB 155 728 $5.60

Louvain U. (Belgium).
INHIBITION PROCESSES IN METHANE-OXYGEN FLAMES, by A. Van Tiggelen. Final technical rept. no. 3, 1 Apr 60-31 Mar 61, as Contract DA 91-591-EUC-1425. Apr 61, 59p. 10 refs. AD-254 502.

DESCRIPTORS: *Flames, *Methanes, *Oxygen, *Flame propagation, Methyl radicals, Chlorides, Bromides, Mixtures, Measurement, Luminescence, Inhibition, Free radicals, Photoemission, Excitation, Combustion.

Ternary flammable mixtures of methane, methylchloride and O were investigated at different compositions and degrees of dilution with N. From the measurement of burning velocities and flame temperatures the overall activation energy of the branching reaction has been determined. This activation varies over a maximum of about 60 kcal from the value 38 kcal for pure methane-oxygen to the value 47 kcal for pure methylchloride oxygen when methane is increasingly replaced by methylchloride. The mean molecular weight of the chain carriers increases from a value of 17 (OH) to a value of about 32 (C) in pure $CH_3Cl/O_2$ flames. This case of ternary flames seems to correspond to a rather strong mutual inhibition. Measurements of the OH, CH and $C_2$ emission in the flame spectrum were made in the same mixtures; the formation of the excited radicals appears to follow the same path in both fuels. It indicates that the chemiluminescent exitation process involves the same fragments in both flames. A few measurements have been made on methane, methylbromide-oxygen flames. The general conclusions are similar to what can be derived from $CH_4$ - $CH_3Cl$ - $O_2$ flames; however the inhibition by $CH_3Br$ is more efficient. (Author)

CF-61-3-94 $2.60

Oak Ridge National Lab., Tenn.
ADSORPTION OF URANIUM ON HYDROUS ZIRCONIUM OXIDE FROM URANYL SULFATE SOLUTIONS AT ELEVATED TEMPERATURES, by J. C. Banter and S. H. Wheeler. 1 Mar 61, 26p.

CF-61-5-74 $1.10

Oak Ridge National Lab., Tenn.
FINAL CYCLE PLUTONIUM RECOVERY BY AMINE EXTRACTION, by C. F. Coleman. 24 May 61, 10p.

TID-13085 $3.60

Ohio U., Athens.
THE REACTION OF URANIUM WITH SOME OXIDIZING AGENTS IN LIQUID AMMONIA, by R. J. Kline. Final technical rept. on Contract AT(11-1)-362. 1 June 61, 36p.

PB 156 834 $1.60

Rensselaer Polytechnic Inst., Troy, N. Y.
A CAPILLARY-TYPE CONDUCTANCE CELL FOR MOLTEN FLUORIDES, OXIDES, AND CARBONATES, by George J. Janz and Max R. Lorenz. Technical rept. no. 7 on Contract Nonr-591(10). Aug 60, 19p. 15 refs AD-245 346.

DESCRIPTORS: *Electrochemistry, *Electrolytic cells, *Oxides, *Fluorides, *Carbonates, Magnesium compounds, Silicon compounds, Crystals, Machining, Electrical properties.

Limited measurements were made to study the corrosion resistance of MgO single crystals in molten carbonates. Three solubility measurements on $Na_2CO_3$ showed that saturation was reached quickly. The conductance cell was calibrated by using molten salts as standards. Calibration data for molten $KNO_3$ showed that the average cell constant is 1/197.8 cm at 25°C which agrees with the value obtained in molten KCl.

Aside from the inertness of MgO in some highly reactive melts, several factors favor MgO over $SiO_2$ in construction of conductance cell components for measurements at high temperatures. MgO has a higher melting point (2800°C) and limit of usefulness (2400°C). Thermal conductivity near 1500°C is at a minimum, 0.01 cal/sq cm/sec/°C and the electrical resistivity is about $10^8$ ohm cm at 1000°C as compared with about $10^4$ ohm cm at 1300°C for $SiO_2$. The machining of MgO is possible but not as readily as with $SiO_2$. With the present cell, the correction for frequency dependence of resistance is about 1% or less.

PB 155 861 $3.60

Stanford Research Inst., Menlo Park, Calif.
PHOTOCHEMISTRY IN THE SOLAR FURNACE-FLOW SYSTEMS AND THE DECOMPOSITION OF NITROSYL CHLORIDE, by Rudolph J. Marcus and Henry C. Wohlers. Scientific rept. no. 2 on Contract AF 19(604)7302. 3 Feb 61, 38p. 28 refs. Rept. no. 5; SRI Proj. no. SU-3223; AFCRL-254; AD-254 801.

DESCRIPTORS: *Solar furnaces, *Photolysis, Photochemical reactions, *Photochemistry, Nitroso radicals, Chlorides, Chlorine, Nitrogen compounds, Oxides, Light, Carbon tetrachloride.

The design, construction, installation, testing, and use of various flow systems in a solar furnace are described. These flow systems allow the use of the solar furnace as a light source for photochemical reactions. They achieve two objectives: (1) the separation of the photoproducts before appreciable back reaction occurs, and (2) adequate temperature control without any cooling. The flow systems were used to study the photolysis of nitrosyl chloride in carbon tetrachloride solution to form nitric oxide and chlorine. The quantum yield of this reaction in the solar furnace is 0.22. (Author)

PB 156 073 $3.60

[University of Southern California, Los Angeles]
THE SUBSIDENCE BEHAVIOR OF SUSPENSIONS OF COLLOIDAL SILICA. I. TYPES OF SUSPENSION. EFFECT OF INITIAL DEGREE OF DISPERSION. Technical rept. no. 6 on Particle Interactions in Colloidal Suspensions in Nonplar Media [Contract DA 04-495-ORD-1296]. [1961] 39p. OOR rept. no. 1923:6; AD-254 469.

DESCRIPTORS: *Colloids, *Silicon compounds, Dioxides, Solutions. Solvates, Gels, Sedimentation, Chemical bonds, Hydrogen, Molecular association, Liquids, Organic solvents.

Dispersions of non-porous colloidal silica in non-aqueous solvents display three distinct types of subsidence behavior. In one type a wide distribution of sizes of aggregates settles more or less independently, with the finer aggregates forming a semi-permanent sol. In the second the distribution of aggregate sizes is such that only colloid-free supernatant liquid remains after a very short subsidence period, but the subsidence still comes under the general classification of hindered settling of semi-independent aggregates. In the third the interparticle forces are sufficient to induce the formation of a weak gel which then undergoes uniform compaction. A procedure has been found for representing the subsidence data for gelating suspensions which shows clearly how the subsidence process is divided into two gradually merging stages, one involving gelation, flocculation and subsidence simultaneously and one involving compacting of the resulting gel. The representation is a plot of dlogV/dt versus concentration. Suspensions of initially different concentration approach a limiting curve assymptotically when represented in this way. (Author)

## EARTH SCIENCES

PB 152 733 $13.50

Chesapeake Bay Inst., Johns Hopkins U. [Annapolis, Md.]
PHYSICAL AND CHEMICAL LIMNOLOGY OF CONOWINGO RESERVOIR, by R. C. Whaley. Final rept. Apr 59-May 60. June 60, 198p. 1 ref. Technical rept. 22; Data rept. 32; Reference 60-2; AD-245 042.

DESCRIPTORS: *River currents, *Estuaries, Temperature, Oxygen, Measurements, Plants, Photosynthesis, Dams, Tables.

A study of the chemical and physical limnology of Conowingo Reservoir was undertaken. This study was to (1) determine the character of water movements in Conowingo Reservoir in relation to inflow, outflow, wind, and thermal stratification; (2) determine the seasonal and spatial temperature structure in the reservoir; (3) determine seasonal and spatial distributions of dissolved oxygen and pH; and (4) determine the organic production by aquatic plants and the oxygen balance for the reservoir. (Author)

PB 155 229 $2.60

Indiana U., Bloomington.
COMMERCIAL GEOGRAPHY OF THE BRITISH VIRGIN ISLANDS, by Robert C. Kingsbury. Technical rept. no. 2 on Contract Nonr-908(13). June 60, 24p. 30 refs. AD-250 443.

DESCRIPTORS: Great Britain, Virgin Islands, Antilles Islands, *Commerce, *Geography, Economics.

Contents:
The physical setting
The human element
The historical background
Land use and land ownership
Production
Invisible exports
Imports and Commercial enterprises
Outlook and recommendations

## Climatology and Meteorology

PB 171 591 $0.75

Aeronautical Research Lab. [Air Force Research] Div., Wright-Patterson AFB, Ohio.
A HAZE-METER, by Myron H. Yang. Rept. on Light Amplification. Feb 60, 24p. 9 refs. WADC Technical note 59-319; AD-236 554.

DESCRIPTORS: *Haze, *Sky brightness, Sky, Colors, Determination, Meters, Measurement, Astronomy, *Meteorological instruments.

The possibility of constructing a Haze-meter as a useful indicator to the inexperienced observer for daytime astronomical recordings is investigated. Theories involving Rayleigh Scattering from the basis for investigation of more accurate measurements in sky color by instrument, and an analysis of the nature of scattering particles and the number of processes taking place in the spectrum of scattered light contribute to more definite determinations of the amount of haze. An experimental Haze-meter was built by using a dichromatic mirror to split the scattered sunlight. The ratio in intensity of red to blue light which is determined by the haze was detected by special photocells with proper filters in a Wheatstone bridge circuit. After correction of certain calibration difficulties, suitable transistorized amplifiers evolved and were tested for amplification. Schematics showing the wiring, housing, mounting, and details of the dichromatic mirror are included. Also, included are spectral response curves and tabulations for Kodak 1241, RCA 6694A photo-conductive cells and circuit diagrams for the 2- and 3-stage direct coupled amplifiers. (Author)

PB 157 171 $2.60

Chicago U., Ill.
A STUDY OF HURRICANE TRACKS FOR FORECASTING PURPOSES, by José Colón. [Rept. on Contract N6ori-20(23)]. [1952] 21p. 4 refs. AD-10 467.

This report released for sale to the public 3 Aug 61.

DESCRIPTORS: Tropical cyclones, *Hurricanes, *Weather forecasting, Statistical analysis, Tracking.

Climatological data on hurricane tracks in the Caribbean Sea, Gulf of Mexico, and adjacent regions of the Atlantic Ocean for the period 1887 to 1950 were reduced to a form which permitted a quantitative estimate of the probability of success of persistence forecasting of the motion of tropical cylones. Long-period fluctuations in the yearly number of hurricanes are suggested; the variation was produced by storms forming east of 70°W. Risk computation showed that October is the most dangerous month for Florida; tables are presented for making similar computations for any location within the area. The estimated average number of hurricane days per month varied from 2 for June to 16 in September; the average duration of storms south of 35°N was about 6 days. Clusters of storms were most frequent in August, September, and October and occurred predominately among the storms moving from the eastern Atlantic. Climatological data are presented which permit a quick determination of the probability of motion along each direction at each 5° latitude-longitude square. The median speed of motion was highest in the 10° to 20° belts and north of 30°N and was slowest between 20° and 30°N. Deviations from the median are fairly small in the south and large in the north. Charts are presented from which the confidence of a persistence forecast at any locality in any month may be read. [Nonpersistent storms moved mainly to the right of their previous path. The median angle of turning was 20° to 30° in most areas; the angle was smallest in the south and largest in the vicinity of the subtropical ridge.]

PB 157 172 $1.60

[Florida State U., Tallahassee].
A NOTE ON HURRICANE ABLE OF 1952, by L. Sherman and I. Carino. [Rept. on Contract Nonr-988(01)]. [1953] 20p. 4 refs. AD-16 366.

This report released for sale to the public 2 Aug 61.

DESCRIPTORS: *Hurricanes, Analysis, Tropical cyclones.

An analysis of hurricane Able (1952) is presented which locates both the eye and the associated hyperbolic point. The results of 2 independent analyses are summarized in terms of the tracks of the cyclonic indraft points and hyperbolic points. The method of direct streamline analysis was employed. The streamlines were first sketched on the basis of strong winds alone, and then extended into the light-wind regions. The asymptotes of convergence and divergence were located on the basis of available wind reports, and greater weights were given to stronger winds. The wind field was analyzed at the reconnaissance flight level for the 2 days for which data were available. No flights were made once the storm entered the coast. The positions of the hyperbolic point at this level are indicated in a diagram together with several positions for higher level maps. The upper wind maps upon which these positions are based are appended. A set of surface streamline maps, together with a brief comment on those winds exceeding 8 knots that were disregarded in the neighborhood of singular points, is also presented in an appendix. The analysis indicated that it may be practicable to track the hyperbolic point as well as the cyclonic-indraft point, and once this is done, the disturbance has an orientation. However, the direction of storm movement may not in general be determined by this kind of analysis.

PB 157 173 $2.60

[Florida State U., Tallahassee].
A STUDY OF HURRICANE BAKER OF 1952, by Isidro D. Carino. [Rept. on Contract Nonr-988(01)]. [1953] 23p. 2 refs. AD-16 367.

This report released for sale to the public 2 Aug 61.

DESCRIPTORS: *Hurricanes, Analysis, Tropical cyclones.

An analysis similar to that for hurricane Able (AD-16 366) was made of hurricane Baker (1952). The results of the study indicated that this type of analysis can be used as a forecasting aid only in those cases where no rapid displacement of the hyperbolic point is observed with height. The technique cannot be applied during the existence of a cold high west of the forward left quadrant of the hurricane. In this case a large slope of the asymptote of convergence results and leads to a considerable tilt of the hyperbolic point with height. For a rapid displacement of the hyperbolic point with height, a knowledge of its position at the surface is inadequate and analysis of higher levels is required. The slow movement of the eye of hurricane Baker was accompanied by the hyperbolic point stagnating in a general area, and it moved with the eye at the same speed with the exception of a rapidly changing intensity and basic current. Surface streamline charts are appended together with upper air charts.

PB 157 170 $3.30

Massachusetts Inst. of Tech., Cambridge.
RADAR ANALYSIS OF HURRICANES "CAROL" AND "EDNA", by Harry D. McIntyre. Master's thesis. Rept. on Weather Radar Research Project, Contract DA 36-039-sc-42625. 23 May 55, 34p. 9 refs. AD-64 877.

This report released for sale to the public 3 Aug 61.

DESCRIPTORS: Tropical cyclones, *Hurricanes, Tracking, *Meteorological radar.

Time-lapse PPI photographs taken during the passage of the 2 hurricanes made it possible to measure the motions of small precipitation areas. The motions show counter-clockwise rotation of the areas around the centers of the storms. Wind fields constructed for the gradient level and for 850-, 700-, and 500-mb levels were compared with the motion fields. The 850-mb wind fields gave the best match with the motion fields. Examination of the motions failed to uncover a relationship between the motion speed and the distance from the storm center. Divergence at different points in the storms was calculated by the use of a triangulation technique, and divergence patterns for the 2 storms were constructed.

PB 156 737 $4.60

Massachusetts Inst. of Tech., Cambridge.
WEATHER RADAR RESEARCH. Final rept. on Contract W36-039-sc-32038. 28 Feb 51, 42p. 5 refs. ATI-114 021.

This report released for sale to the public 1 Aug 61.

DESCRIPTORS: *Meteorological instruments, *Meteorological radar, Microwaves, Weather forecasting, Radar interference, Radar analysis, Atmosphere, Absorption.

This Final Report is designed to serve as a summary of the technical accomplishments of the Weather Radar Research project over its first five years of operation. No detailed technical results are described, but the general program is reviewed as a coordinated whole with frequent reference to Technical Reports Nos. 1 through 15 and published papers. This report also describes those studies made possible by the first contract which are now proceeding under Contract No. DA-36-039-sc-124, and mentions other scientific contributions which do not result in reports or papers.

## Geology

UCRL-13002 $3.60

Colorado School of Mines Research Foundation, Inc., Golden.
SOURCES OF INFORMATION ON ROCK PHYSICS, by L. Burgin, 28 Apr 61, 36p.

PB 157 212 $8.60

Columbia U., New York.
A QUANTITATIVE GEOMORPHIC STUDY OF DRAINAGE BASIN CHARACTERISTICS IN THE CLINCH MOUNTAIN AREA, VIRGINIA AND TENNESSEE, by Victor C. Miller. Technical rept. no. 3 on Contract N6onr 271-30. 1953, 96p. 10 refs. AD-57 755.

This report released for sale to the public 4 Aug 61.

DESCRIPTORS: Geography, Virginia, Tennessee, *Drainage, Geology, Mountains, Terrain, Water, *Hydrology.

Quantitative study of stream length, basin area, drainage density, basin circularity, bifurcation ratio, valley-side slopes, and hypsometric curves was made of two kinds of topography in the Clich Mountain area of Virginia and Tennessee: (1) Clinch Mountain, a homoclinal ridge whose lithology is constant, but whose dip changes along the strike. (2) Three maturely dissected areas of homogeneous topographic facies and dendritic drainage, one of which is underlain by Copper Creek dolomite, a second by sandstones and shales of the Athens formation, a third by the shaly Pennington formation. Samples of the form elements were taken from large-scale topographic maps and air photographs, checked by field observations. Significant differences in sample means were determined through analysis of variance.

## Physics of the Atmosphere

PB 155 730 $1.60

Denver U., Colo.
DISTRIBUTION OF WATER VAPOR IN THE STRATOSPHERE AS DETERMINED FROM INFRARED ABSORPTION MEASUREMENTS, by David G. Murcray, Frank H. Murcray, and Walter J. Williams. Scientific rept. no. 1 on Contract AF 19(604)7429. Jan 61, 19p. 15 refs. AFCRL-219; AD-254 613.

DESCRIPTORS: *Water vapor, *Stratosphere, Infrared radiation, Absorption, Measurement, Distribution, *Solar spectrum, *Infrared spectroscopy, New Mexico.

The infrared solar spectrum from 1 to 10 microns was observed at various altitudes from the ground to 90,000 ft over Alamogordo, N. Mexico, April 18, 1960. By studying the variation with altitude of the 6.3 micron water vapor band and making certain assumptions concerning the pressure dependence of the absorption, it has been possible to determine the distribution of water vapor with altitude up to 90,000 ft. The method used is discussed in detail. The results are presented as an altitude profile of the mixing ratio and are found to be in good agreement with the results obtained by other investigators using different techniques. The amount of water vapor present above the peak altitude reached by the balloon is also determined from the spectra. It is found that there was at least 11 microns of precipitable water vapor present above 90,000 ft over Alamogordo at the time of the flight. (Author)

PB 151 399-4 $1.50

National Bureau of Standards, Boulder, Colo.
MEAN ELECTRON DENSITY VARIATIONS OF THE QUIET IONOSPHERE. 4, JUNE 1959, by J. W. Wright, L. R. Wescott, and D. J. Brown. May 61, 57p. 5 refs. Technical note no. 40-4.

DESCRIPTORS: *Ionosphere, Analysis, *Electrons, Density, Determination.

The results of this program for one month are illustrated graphically. (See also PB 151 399-3).

## ENGINEERING

### Aeronautical Engineering

PB 157 210 $6.60

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
PREDICTION OF LANDING PERFORMANCE FOR HIGH-SPEED AIRPLANES, by Norris Jay Hanks. Thesis. Aug 55, 66p. 18 refs. Rept. no. GAE 55-4; AD-72 651.

This report released for sale to the public 3 Aug 61.

DESCRIPTORS: *Jet planes, Landing, Airplane landings, Mathematical prediction, Aircraft, Flight testing.

A simple, nonrigorous method was derived for predicting landing performance. Equations are presented for calculating airplane performance from final approach to full-stop conditions, with provisions for a 50-ft obstacle to full stop. The predicted performance, by this and 5 other methods, was compared with flight-test results for the F-86D and the YRF-84F; the predicted performance by the nonrigorous method agreed with flight-test results for operational short-field landings for the 2 aircraft. The nonrigorous method was more realistic than methods found in the literature, and provided more information on the landing maneuver.

PB 157 067 $7.60

Booz, Allen and Hamilton, Chicago, Ill.
ATMOSPHERIC PRESSURE CRITERIA FOR AIRCRAFT AND AIRBORNE EQUIPMENT, by C. Frank Riley, Jr., and Paul F. Walker. Rept. no. 4 on Environmental Criteria for Aircraft and Airborne Equipment, Contract AF 33(616)2689. June 55, declassified 1 Jan 61. 74p. 139 refs. WADC Technical note 55-98; AD-90 046.

This report released for sale to the public 1 Aug 61.

DESCRIPTORS: *Aircraft, *Aircraft equipment, Climatic factors, Wind, Atmosphere, Pressure, Temperature, Thermal stresses.

Atmospheric pressure falls into two major classes, ambient pressure and wind. The characteristics, extremes, world-wide distributions, effects and preventive measures are presented for each. Design criteria are discussed, and latest accepted design requirements and test procedures are listed. Ambient pressure is found to be of minor importance, with its principal effects being (1) electric arc-over at high altitudes, (2) increased brush wear and (3) reduced air cooling efficiency. Wind loading is a more troublesome factor inasmuch as it affects operational performance of aircraft as well as being a basic structural design consideration. A bibliography of information sources on wind and ambient pressure is provided. (Author)

PB 157 065 $11.00

Booz, Allen and Hamilton, Chicago, Ill.
TEMPERATURE CRITERIA FOR AIRCRAFT AND AIRBORNE EQUIPMENT, by C. Frank Riley, Jr. and Paul F. Walker. Rept. no. 2 on Contract AF 33(616)2689. June 55, declassified 1 Dec 60, 148p. 326 refs. WADC Technical note 55-96; AD-88 485.

This report released for sale to the public 1 Aug 61.

DESCRIPTORS: *Aircraft, *Aircraft equipment, Climatic factors, *Thermal stresses, *Aerodynamic heating, Temperature, High altitude, Flight speeds, Airborne.

This report presents a discussion of the effects of high and low temperature extremes on aircraft and airborne equipment. Temperature is first discussed in terms of the four heat sources controlling the aircraft thermal environment: (1) ambient air temperature, (2) solar radiation, (3) aerodynamic heating, and (4) heat-producing equipment. Functional effects and indicated preventive measures are presented for both high and low temperature extremes. Principal low temperature difficulties are experienced on ground during immediate preflight and postflight periods. These generally can be overcome through utilization of standard design and maintenance procedures. The high temperature environment has been increasing steadily along with increased aerodynamic heating caused by the advanced flight speeds. High temperature affects virtually every part of the aircraft, but reduction in life of electronic equipment and weakening of structural materials appear currently to be the most serious problems. Appropriate preventive measures and the various cooling methods are discussed. Present and future design requirements and test procedures are listed, and an extensive bibliography of information sources is provided. (Author)

PB 157 146-1 $6.60

Columbia U. [New York].
CUMULATIVE FATIGUE DAMAGE OF AIRCRAFT STRUCTURAL MATERIALS. PART 1: 2024 AND 7075 ALUMINUM ALLOY, by A. M. Freudenthal, R. A. Heller, and P. J. O'Leary. Rept. on Materials Analysis and Evaluation Techniques, Contract AF 33(616)2274. June 55, 69p. 11 refs. WADC Technical note 55-273, Pt. 1; AD-88 635.

This report released for sale to the public 2 Aug 61.

DESCRIPTORS: *Aluminum alloys, *Fatigue (Mechanics), Tests, Aerodynamic data, Aircraft materials.

The object of this investigation is to determine the effect of randomly varying stress-amplitudes representing gust or maneuver load sequences encountered in flight on the fatigue life of AA7075 and AA2024 aluminum by testing small rotating beam specimens subject to random time series of stress-amplitudes derived from specific frequency distributions of stress-amplitudes. Over a thousand specimens were tested. Three sets of six stress levels were used for each material with which nine different load distributions were constructed. In addition, conventional constant amplitude tests were carried out to determine the S-N diagrams. The results were statistically analyzed and presented on the basis of two and three parameter extreme value distributions.

While a detailed evaluation of the test results is presented in the Second Part of this report (PB 121 909), the tentative statement can be made that according to the test results at present available, only for the least severe stress distributions within the low range of stresses does the sum of the cycle ratios itself provide a rough estimate of the cumulative damage under varying stress-amplitudes.

PB 157 140 $8.10

Engineering Div., Air Materiel Command, Wright-Patterson AFB, Ohio.
FIST TYPE PARACHUTE, DESIGN, USE AND CONSTRUCTION OF, by Theodor Knacke. 30 June 48, 88p. 9 refs. Memo. rept. no. MCREXE-672-19LL; ATI-56 533.

This report released for sale to the public 3 Aug 61.

DESCRIPTORS: Parachutes, *Ribbon parachutes, Design, Aerodynamic data, Tests, Deceleration.

The FIST parachute is a stable, highly adaptable, and useful parachute design of predictable performance, especially suited to high speed and/or high altitude applications. Design, use, and construction data presented in Appendices to this report should be of value to all parachute, missile, and target manufacturers.

PB 157 175 $4.60

[Flight and Engineering Test Group] Wright Air Development [Div.] Wright-Patterson Air Force Base, Ohio.
EQUIPMENT AND HEATING METHODS FOR STRUCTURAL TESTING AIRCRAFT AT ELEVATED TEMPERATURES, by Richard B. Baird. Rept. on Structural Testing at Elevated Temperature. Sep 55, 50p. 9 refs. WADC Technical note 55-149; AD-97 420.

This report released for sale to the public 4 Aug 61.

DESCRIPTORS: *Aircraft, Structures, Test methods, Temperature, Test equipment, Heating, Aerodynamic heating.

The main objective of this project was the establishment of a pilot plant for use in determining equipment, methods, and techniques required for structural testing aircraft and component parts thereof under elevated temperature conditions. Various methods and techniques for structural testing at elevated temperatures have been determined and the present "State of the Art" is such as to allow the establishment of a full-scale elevated temperature structural test facility. (Author)

PB 157 149 $8.10

Ohio State U. Research Foundation, Columbus.
AN ENERGY THEORY OF TRANSVERSE IMPACT ON BEAMS. INCLUDING THE EFFECTS OF SHEAR, ROTATORY INERTIA AND LATERAL CONTRACTION, by Bruno A. Boley, Robert E. Heninger and Vincent P. Zimnoch. Rept. on Contract N6-onr-225-29. Jan 52 88p. 28 refs. ATI-150 288.

This report released for sale to the public 3 Aug 61.

DESCRIPTORS: *Beams, Load distribution, Deformation, Shear stresses, *Structures, Impact shock, Energy, Theory.

After a review of the literature, a theory for beams under transverse impact is derived. In this theory, expressions are assumed, in terms of some arbitrary parameters, describing the distance traveled along the bar by the disturbance, the displacement of the bar, and a portion of the displacement which is assumed to be caused by bending alone. The arbitrary parameters are then determined with the aid of the principle of virtual displacements. The effects of shear deformations, rotatory inertia and lateral contraction are included, and their importance is discussed. General considerations concerning the velocity of propagation of a disturbance are presented, as well as a simple approximate formula for this velocity. Four specific applications of the theory are worked out in detail; the shear force and bending moment distrubutions, the deflected shape and the variation of the velocity of propagation are calculated. The error in the results given by the approximate formula is, in the worst case, 15 percent of the more accurate calculated value. (Author)

PB 155 862 $9.10

Pennsylvania U., Philadelphia.
THE USE OF THE EARTH'S ELECTRIC AND MAGNETIC FIELDS FOR THE DETERMINATION OF THE DRIFT AND GROUNDSPEED OF AIRCRAFT, by Enos E. Witmer. [1942] 104p. 12 refs. NAF rept. no. IDS 55-42.

DESCRIPTORS: *Aircraft, Drift, Velocity, Determination, *Terrestrial magnetism, *Electromagnetic fields.

There are two main types of methods of using the electromagnetic field of the earth to measure the velocity of an airplane with respect to the surface of the earth. The methods of the first type require the measurement of the electric field strength and the magnetic induction or certain components of these quantities. The method of the second type depends on the measurement of the electromotive force in loops of wire carried on airplanes.

PB 156 743 $6.60

Polytechnic Inst. of Brooklyn, N. Y.
BIBLIOGRAPHY OF CREEP FOR STRUCTURAL ENGINEERS, by Joseph Kempner and N. D. Hoff. Rept. on Structural Testing of Elevated Temperatures, WADC Pilot Plant, Contract AF 33(616)116. Mar 56, 64p. 196 refs. WADC Technical note 56-40; AD-99 183.

This report released for sale to the public 1 Aug 61.

DESCRIPTORS: *Bibliography, *Creep, Structures, High temperature research, Heat resistant alloys, Refractory materials, Aircraft, Design.

The listing is chronologically presented and many of the articles may prove of value in regards to the process by which the theory has been developed. Publications which are not readily available have not been included.

PB 157 214 $1.10

School of Aviation Medicine [Brooks AFB] Tex.
ASSESSMENT OF INSTRUMENT FLYING PERFORMANCE: TECHNIQUES FOR AUTOMATIC GRAPHING OF AN AIRCRAFT'S FLIGHT PATH, by Roger B. Loucks. 17 Aug 45, 8p. Proj. no. 383, rept. no. 1; ATI-115 175.

This report released for sale to the public 4 Aug 61.

DESCRIPTORS: *Aircraft, Flight testing, *Flight paths, Recording devices, Automatic, *Instrument flight.

A graphic record of the flight path of an airplane is potentially valuable for research on the relative effectiveness of various types and arrangements of flight instruments and the contribution of various amounts of ground trainer instruction to instrument flying proficiency. Four methods for obtaining a graphic record of the flight path are described, two of which have been given preliminary trial as a consequence of the availability of the required equipment.

PB 157 213 $2.60

School of Aviation Medicine [Brooks AFB] Tex.
EVALUATION OF AIRCRAFT ATTITUDE INDICATORS ON THE BASIS OF LINK INSTRUMENT GROUND TRAINER PERFORMANCE, by Roger B. Loucks. 22 June 45, 23p. Proj. no. 341, rept. no. 1; ATI-52 425.

This report released for sale to the public 4 Aug 61.

DESCRIPTORS: *Flight attitude indicators, Tests, Flight instruments, Training planes.

Four different types of artificial horizon indicators have been compared with the standard AAF type of horizon indicator in terms of the objectively scored Link trainer performance of subjects who attempt to maintain the fuselage in level and horizontal flight under conditions of rough air. The artificial horizon indicator in which the moving pointer and the horizon bar rotate in the opposite direction to that of the moving elements in the standard AAF type of flight indicator is the one instrument of the four that shows a superiority which has unquestionable statistical significance. The direction of rotation of the moving elements in these attitude indicators comprises the factor of major importance which the novice reacts to most directly. (Author)

## Chemical Engineering

PB 155 639 $14.50

Office of Saline Water, Dept. of the Interior, Washington, D. C.
SPECIFICATION DOCUMENTS, CONDITIONS, DETAIL SPECIFICATIONS AND DRAWINGS FOR A 250,000 GALLON PER DAY ELECTRODIALYSIS BRACKISH WATER CONVERSION PLANT AT WEBSTER, SOUTH DAKOTA, by A. L. Miller. Rept. on Contract OSW 14-01-001-212. 20 Sep 60, 211p. Specifications no. 212.

DESCRIPTORS: *Sea water, *Desalination, *Electrodialysis, *Distilling plants, Specifications.

PB 171 673 $1.50

Office of Technical Services, Dept. of Commerce, Washington, D. C.
CHEMICAL PRODUCTS AND PROCESSES: GOVERNMENT-OWNED INVENTIONS AVAILABLE FOR LICENSE ACCUMULATED JULY 1958 THROUGH DECEMBER 1960. [1961] 62p. Patent Abstract Series, no. 2, suppl. no. 3.

DESCRIPTORS: *Patents, *Chemicals, Production, *Chemical engineering, *Bibliography, Inventions.

Supplements PB 111 465, Dec 53, PB 111 854, Jan 54-June 55, and PB 151 507, July 55-June 58.

For each invention the title of the invention, the United States Patent number, the name of the inventor, the name of the Government agency administering the patent, and an abstract of the patent on the invention are given. Evaluation of the invention with respect to its industrial application is facilitated by an examination of the technical data contained in the abstract.

## Electrical and Electronic Engineering

PB 155 896 $2.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
ECHO AREA FROM SATELLITE WAKES ACTING AS DIELECTRIC ROD ANTENNAS, by Leon Peters, Jr. Scientific rept. no. 1 on Contract AF 19(604)7270. 31 Jan 61, 25p. 17 refs. Rept. 1116-3; AFCRL-89; AD-254 857.

DESCRIPTORS: *Satellite vehicles, Frequency, *Radar echo areas, Dielectric properties, Ionization, Dielectrics, Ionosphere, Wake, Satellite vehicle trajectories.

The wake of a satellite traveling through the ionosphere may be a source of large echo area. This echo area is estimated by treating the wake as a dielectric rod antenna. The diameter and the length of the wake required in order that the appropriate mode be supported are considered. Another requirement that needs to be satisfied in order that the wake may have a significant echo area is that the transmitter and receiver both must be in a position such that the satellite is either traveling toward or away from both of them. Also the satellite should be traversing a highly ionized region of the ionosphere such as the F layer. The frequency range for which significant echo areas are obtained is just above the ionospheric plasma frequency such that the dielectric constant of the wake relative to the ionosphere is sufficiently large so that the dielectric rod mode is excited. (Author)

PB 155 650 $2.60

Applied Psychology Corp., Arlington, Va.
RECOMMENDED RESEARCH AND DEVELOPMENT FOR A TACTICAL IMAGE DATA REDUCTION SYSTEM (A WORKING PAPER), by E. Laurence Chalmers. Jan 61, 27p.

DESCRIPTORS: *Data processing systems, Design, *Optical images, Analysis, Data, Reduction.

PB 156 744 $5.60

[Army Signal Research and Development Lab.] Fort Monmouth, N. J.
A METHOD FOR THE DETERMINATION OF THE STATE OF CHARGE OF ALKALINE STORAGE BATTERIES, by Karl Kordesch. 9 June 55, 55p. 4 refs. Technical memo. no. M-1664; AD-74 635.

This report released for sale to the public 1 Aug 61.

DESCRIPTORS: *Alkaline cells, Test methods, Voltage, Determination, Test equipment, Design, *Storage batteries, Circuit testers.

PB 157 016 $11.50

Army Signal Research and Development Lab., Fort Monmouth, N. J.
RADIO RECEIVER R-745/VRC, by John Fazio. 1 Oct 59, 157p. USASRDL Technical rept. 2065; AD-229 386.

DESCRIPTORS: Very high frequency, *Radio receivers, Tests, Frequency modulation, Radio communication systems, Radio equipment, Communication equipment

The performance of a pilot run model of a VHF continuously tunable FM receiver was tested to determine compliance with technical requirements and attainment of development objectives. Major objectives included high order of frequency stability, wide frequency coverage (20 - 70 mc), unitized construction, use of printed circuits, extensive application of transistors, small size and low power drain. Results of tests indicated that the receiver would be suitable as a direct replacement for the 3 auxiliary receivers R-108, R-109, R-110 of the present standard FM vehicular combat area radio sets AN/GRC-3-8. (Author)

PB 155 973 $4.60

Bell Telephone Labs. [Whippany] N. Y.
ENGINEERING SERVICES ON TRANSISTORS. Interim technical rept. no. 1, 1 Apr-30 June 60, on Contract DA 36-039-sc-85352, continuation of Contract DA 36-039-sc-64618. 31 Aug 60, 42p. 13 refs. AD-247 269.

DESCRIPTORS: *Transistors, Circuits, Reliability, Silicon, Germanium, Microwave equipment, Diodes, Oxidation, Design.

Transistor Reliability: Studies are continuing on the various aspects of the mechanism of oxidation of silicon and its stabilizing effects on surfaces and junctions. New and improved transmission type transistors: Work has continued on the M2107 microwave germanium transistor for 3 kmc service. The fabrication and evaluation of transistors with 0.5 micron base-diffusion depth has continued. The use of an epitaxial structure has decreased the high frequency collector series resistance and leads the way to further evaluation of thinner base diffusion depths and higher values of base sheet resistance. Work was initiated on the design considerations for a transistor required to produce 1-watt rms output power at 30 per cent efficiency, and 20-db power gain, at 1000 mc. The preliminary design was completed to the point of showing feasibility, and indicating stability at 1 kmc in the absence of lead inductance and stray capacitance. (Author) (See also PB 148 330)

PB 154 188 $6.60

Bliley Electric Co., Erie Pa.
DEVELOPMENT OF HIGH TEMPERATURE-LOW FREQUENCY QUARTZ CRYSTAL UNITS FOR OPERATION AT A TEMPERATURE OF +200°±5°C, by J. M. Wolfskill and Robert Mouck. Final engineering rept. May 58-Dec 59, on Contract NObsr-72532. Dec 59, 66p. AD-231 968.

DESCRIPTORS: *Crystal oscillators, *Quartz crystals, Temperature, Low frequency, Shock, Vibration, Piezoelectric crystals.

A record is given of the development and fabrication of special, low frequency, high operating temperature quartz crystal units. Two hundred prototype units, with nominal frequencies at various points covering the 80 kc to 500 kc frequency range, were constructed. These units were designed to operate at the +200°±5°C temperature. The frequency tolerance on all the units is ±0.002% of nominal at the +200°±1°C reference temperature, and the maximum frequency deviation at any point in the +195°C to +205°C operating temperature range is ±0.0025% of nominal. Effective resistance levels are considered excellent. In addition, these prototype units can withstand high shock and vibration conditions of 100 G shock and 10 G at 500 CPS. A brief history of the development of these high temperature units is given, and the design details and the process techniques which were utilized to fabricate the prototype units are summarized. Performance data are summarized; the final frequency and effective resistance measurements made on the prototype units are listed, and a recommended specification for units of this kind is presented. (Author) (See also PB 140 852)

PB 154 189 $8.10

Bliley Electric Co., Erie, Pa.
DEVELOPMENT OF HIGH TEMPERATURE-LOW FREQUENCY QUARTZ CRYSTAL UNITS FOR OPERATION OVER VERY WIDE AMBIENT TEMPERATURE RANGES (-60°C TO 200°C PROJECT) by J. M. Wolfskill and Robert Mouck. Final engineering rept. June 59-Dec 60, on Contract NObsr-72532. Dec 60, 85p. AD-248 462.

DESCRIPTORS: *Quartz crystals, Temperature, *Crystal oscillators, Low frequency, Manufacturing methods, Production.

This report describes the development and fabrication of special low frequency quartz crystal units designed to operate over wide ambient temperature ranges, with the upper temperature limit at +200 degrees C. Two separate groups of units are presented. One group includes units which hold at least 0.015% frequency stability over the -60 C to +200 C ambient temperature range. The other group includes units which are designed to hold 0.005% frequency stability over the +25 C to +200 C ambient temperature range. Each group contains sample units with nominal frequencies of 80 kc, 100 kc, 200 kc, 300 kc, 400 kc, and 500 kc. All units are calibrated to within at least 0.01% of nominal. All will withstand shock and vibration conditions of 100 g and 500 cps, and all meet the requirements of specification MIL-C-3098B as to insulation resistance, drop, seal immersion, moisture resistance, capacitance, corrosion, and terminal polarity. This present project confirms the previous conclusion that the crystal unit designs which were established and presented under the

200 ±5°C project can be adapted for use at any point in the temperature range up to +200 C simply by selecting the proper ZZ' orientation for the DT elements, so that the desired temperature-frequency characteristics are produced. (Author) (See also PB 154 188)

PB 171 889 $0.50

Bureau of Naval Weapons, Washington, D. C. CAVITY FREQUENCY METERS H-BAND (7.05 TO 10.00 KMC) X-BAND (8.2 TO 12.4 KMC). BuWeps-BuShips Calibration Program. 19 Apr 61, 15p. [Secondary] Standards Lab. Instrument Calibration Procedure GF-01.

DESCRIPTORS: *Frequency meters, H-band, X-band, Calibration, Instrumentation, Instruction manuals.

This procedure describes the calibration of H-band (waveguide size 1 1/4" x 5/8", outside dimensions) and X-band (waveguide size 1" x 1/2", outside dimensions) absorption type, double-ended, cavity frequency meters.

PB 171 887 $0.50

Bureau of Naval Weapons, Washington, D. C. DECADE RESISTORS 1.0 TO 100,000 OHMS PER STEP. BuWeps-BuShips Calibration Program. 7 July 60, 16p. Secondary Standards Lab. Instrument Calibration Procedure AR-12.

DESCRIPTORS: *Resistors, Calibration, Instrumentation, Instruction manuals, Decade boxes.

This procedure utilizes the direct reading ratio set and a series of standard resistors to measure the Test Instrument incremental resistance per decade step by use of the substitution technique.

PB 171 885 $0.50

Bureau of Naval Weapons, Washington, D. C. ELECTRONIC METERS AC VOLTS, DC VOLTS, DC AMPERES, AND OHMS. BuWeps-BuShips Calibration Program. 31 Oct 60, 29p. Secondary Standards Lab. Instrument Calibration Procedure AQ-13.

DESCRIPTORS: *Voltmeters, *Ammeters, *Ohmmeters, Calibration, Electronic equipment, Instrumentation, Instruction manuals, Direct current, Alternating current.

A sufficient variety of tests is provided to accommodate most multiple-purpose electronic meters. Direct voltage tests are made with a calibrated power supply and suitable voltage dividers. Direct current indications are compared directly with those of an accurate ammeter. Decade resistors are used to check ohmmeter ranges at the half-scale points. Alternating voltage scales are calibrated with a monitored ac supply divided down with a ratio transformer.

PB 171 883 $0.50

Bureau of Naval Weapons, Washington, D. C. GENERAL RADIO 1208-B UNIT OSCILLATOR. BuWeps-BuShips Calibration Program. 31 July 59, rev. 31 May 60, 17p. Secondary Standards Lab. Instrument Calibration Procedure AG-21.

DESCRIPTORS: Radio, *Oscillators, Calibration, Instrumentation, Instruction manuals.

The Test Instrument is a compact oscillator that has a frequency range of 65 to 500 Mc. It requires an external power supply and can be amplitude modulated with an external audio source.

PB 171 775 $0.50

Bureau of Naval Weapons, Washington, D. C. GENERAL RADIO 1211-B UNIT OSCILLATOR. BuWeps-BuShips Calibration Program. 16 Mar 59, rev. 31 May 60, 17p. Secondary Standards Lab. Instrument Calibration Procedure AG-17.

DESCRIPTORS: Radio, *Oscillators, Calibration, Instrumentation, Instruction manuals.

The Test Instrument is a compact oscillator that has a frequency range of 0.5 to 50 Mc. It requires an external power supply and can be amplitude modulated by an external audio source.

PB 171 894 $0.50

Bureau of Naval Weapons, Washington, D. C. LABORATORY PRACTICES NOTEBOOK. BuWeps-BuShips Calibration Program. 25 Apr 61, 58p. 6 refs.

DESCRIPTORS: *Electronic laboratories, Safety, Operation, Instrumentation, Handbooks, Laboratories.

The purpose of the Standards Laboratory Practices Notebook is to provide a source of information pertaining to various phases of laboratory operation. In the history of operating laboratories many problems have arisen and their solutions have been found. This experience has been summarized in a series of practical operating notes on: safety; laboratory facilities and calibration equipment; laboratory operation; equipment operation; processing test instruments; and glossary of metrology terms.

PB 171 886 $0.50

Bureau of Naval Weapons, Washington, D. C. MEGOHM DECADE BOX, SHALLCROSS 980. BuWeps-BuShips Calibration Program. 28 Apr 60, 9p. Secondary Standards Lab. Instrument Calibration Procedure AR-05.

DESCRIPTORS: *Decade boxes, Calibration, Instrumentation, Instruction manuals.

The Test Instrument is a resistance decade box consisting of a one megohm per step decade and a 10 megohm per step decade. It is calibrated by using the resistance measuring facility to measure the total resistance at each step of each decade.

PB 171 893 $0.50

Bureau of Naval Weapons, Washington, D. C. MICROWAVE ATTENUATION, G-BAND (3.95 TO 5.85 KMCPS) 0 TO 45 DB. BuWeps-BuShips Calibration Program. 18 Dec 59, 19p. Secondary Standards Lab. Measurement System Operation Procedure HA-04.

DESCRIPTORS: *Microwaves, Attenuation, G-band, Calibration, Instrumentation, Instruction manuals.

This system utilizes the RF substitution method for attenuator calibration in which a Standard Attenuator is adjusted to maintain a constant RF output level with the Test Instrument first removed and then inserted into the microwave line.

PB 171 891 $0.50

Bureau of Naval Weapons, Washington, D. C.
SIGNAL GENERATOR TS-419/U (AN/URM-64) TS-419A/U (AN/URM-64A). BuWeps-BuShips Calibration Program. 31 Mar 61, 22p. [Secondary] Standards Lab. Instrument Calibration Procedure GG-13.

DESCRIPTORS: *Signal generators, Calibration, Instrumentation, Generators, Instruction manuals.

This procedure describes the calibration of signal generators which have the following general characteristics: frequency range, 900 to 2100 Mc; power output, 0 to -120 dbm; sync output, delayed or undelayed; and modulation, internal or external.

PB 171 892 $0.50

Bureau of Naval Weapons, Washington, D. C.
TEST OSCILLATOR AN/UPM-46 (TS-508/U). BuWeps-BuShips Calibration Program. 20 Apr 61, 10p. [Secondary] Standards Lab. Instrument Calibration Procedure GG-14.

DESCRIPTORS: *Oscillators, Calibration, Instrumentation, Instruction manuals.

The Test Instrument is a battery-powered oscillator with a frequency range of 3.0 to 11.0 KMc. It contains a buzzer to pulse a resonant cavity, and an attenuator tc control the output.

PB 171 890 $0.50

Bureau of Naval Weapons, Washington, D. C.
TEST SET, RADIO TS-622/U (AN/URM-44). BuWeps-BuShips Calibration. 8 July 61, 31p. Secondary Standards Lab. Instrument Calibration Procedure GG-07.

DESCRIPTORS: Radio, *Test sets, *Signal generators, Calibration, Instruction manuals, Generators.

This procedure describes the calibration of the AN/URM-44 Radio Test Set which consists of the TS-622/U Signal Generator, transit case, and accessory cables. The only item normally requiring calibration is the TS-622/U Signal Generator.

PB 171 773 $0.50

Bureau of Naval Weapons, Washington, D. C.
TIME INTERVAL UNIT HEWLETT PACKARD 526B OR MX-1636/U (AN/USM-26). BuWeps-BuShips Calibration Program. 14 Oct 60, 8p. Secondary Standards Lab. Instrument Calibration Procedure AF-08 (Revision 1), supersedes AF-02.

DESCRIPTORS: *Time interval counters, Calibration, Instrumentation, Instruction manuals.

The ability of the Test Instrument to trigger on both positive and negative going waveforms is tested with an oscillator and an electronic counter.

PB 171 888 $0.50

Bureau of Naval Weapons, Washington, D. C.
TUBE TESTER, HICKOK 539B. BuWeps-BuShips Calibration Program. 30 Sep 59, 27p. Secondary Standards Lab. Instrument Calibration Procedure AY-03.

DESCRIPTORS: *Test sets, Calibration, Instrumentation, Instruction manuals.

The Test Instrument is a dynamic mutual conductance tube tester having integral voltage supplies with adjustable line voltage input and tube testing networks.

PB 171 884 $0.50

Bureau of Naval Weapons, Washington, D. C.
UHF SIGNAL GENERATOR AN/URM-49 (TS-418/U). BuWeps-BuShips Calibration Program. 6 Apr 61, 28p. [Secondary] Standards Lab. Instrument Calibration Procedure AG-45.

DESCRIPTORS: *Ultra high frequency, *Signal generators, Calibration, Instrumentation, Instruction manuals, Generators.

The Test Instrument is a signal generator having a frequency range of 400 to 1000 megacycles, and an output voltage variable from 0.2 microvolts to 0.2 volts. The RF output can be modulated sinusoidally, or by pulses with repetition rates of 40 to 4000 pulses per second, and pulse widths from 0.5 to 10 microseconds. The output pulse can be delayed in reference to the internal synchronizing pulses. Provision is made for synchronizing the internal modulator, or for modulating the RF output, from an external source.

PB 171 774 $0.50

Bureau of Naval Weapons, Washington, D. C.
VTVM FREQUENCY RESPONSE GENERATOR HEWLETT PACKARD SPECIFICATIONS 23679. BuWeps-BuShips Calibration Program. 18 Dec 59, 14p. Secondary Standards Lab. Instrument Calibration Procedure AF-15.

DESCRIPTORS: Electron tubes, *Voltmeters, *Frequency, *Generators, Calibration, Instrumentation, Instruction manuals.

The Test Instrument is a frequency response test set providing a constant amplitude internal reference voltage of variable frequency from 300 Kc to 10 Mc. Provisions are made to extend the low frequency range with an external oscillator.

PB 152 506 $4.60

David Sarnoff Research Center, Princeton, N. J.
INVESTIGATIONS OF MATERIALS FOR PHOTOVOLTAIC SOLAR ENERGY CONVERTERS, by E. L. Lind, J. J. Loferski and others. Interim rept. no. 3, 1 Feb-30 June 56, on Contract DA 36-039-sc-64643. 31 July 56, 49p. 4 refs. AD-111 732.

This report released for sale to the public 1 Aug 61.

DESCRIPTORS: *Solar energy, *Photoelectric cells, Silicon alloys, Semiconductors, Single crystals, Temperature, Diffusion, Materials.

The work performed during the last interval has been concerned in part with the further development and improvement of the compounds CdTe, GaAs, and InP. GaAs and InP are now available in such quantity and quality that device tests can proceed at the desired rate. This will permit increased attention to device fabrication and the study of important device parameters. The device work has included substantial improvements in technology. It is now possible to make reproducible diffusion type photovoltaic cells from GaAs and InP although it has been difficult to repeat successful units on the latter material. CdTe still remains unsatisfactory in that suitable junctions have not yet been fabricated. Reproducible alloy junctions of good quality have now been made on all three of these materials. The frequency response of units has been measured. It was found that the output of a commercial Nat Fab unit falls to half value at $1.5 \times 10^3$ cps and a diffusion type GaAs unit at $1.2 \times 10^3$ cps. A study of temperature effects on photovoltaic units has been initiated. A silicon alloy type unit yields maximum power at 60°C. Diffusion type cells have not been measured as yet. (Author)

PB 153 047 $6.60

David Sarnoff Research Center, Princeton, N. J.
RESEARCH AND DEVELOPMENT ON MICROWAVE GENERATORS, MIXING DEVICES AND AMPLIFIERS. PHASE I. LOW-NOISE MICROWAVE AMPLIFIERS, by R. W. Peter. Final rept. May 51-Apr 52, on Contract DA 36-039-sc-5548. 28 Dec 54, 63p. 24 refs. AD-62 744.

This report released for sale to the public 4 Aug 61.

DESCRIPTORS: *Microwave equipment, *Microwave amplifiers, Design, Generators, Amplifiers, Noise (Radio), Acoustics, Traveling wave tubes, S-band.

Initial theoretical considerations indicated that the TWT would offer better possibilities for very low-noise amplification than the klystron. The lowest noise factor measured during the duration of the contract was 7.7 db obtained with a narrow-band filter-helix TWT at 3040 mc with a net gain of 25 db. The most important factors contributing to produce this noise factor—at that time the lowest ever obtained — are the following: (1) the development of the variable - perveance divergent - flow low-noise gun with three accelerating regions, called the "three-region gun", (2) the complete elimination of secondary and reflected electrons from the interaction circuit by proper design of the collector; and (3) the use of a high-impedance filter helix.

PB 156 874 $13.00

Electron Tube and Microwave Lab., Calif. Inst. of Tech., Pasadena.
BANDWIDTH LIMITATIONS AND SYNTHESIS PROCEDURES FOR NEGATIVE RESISTANCE AND VARIABLE REACTANCE AMPLIFIERS, by Richard M. Aron. Technical rept. no. 15 on Contract Nonr-220(13). Aug 60, 185p. 29 refs. AD-249 200.

DESCRIPTORS: *Amplifiers, *Microwave amplifiers, *Negative resistance circuits, Synthesis, *Diodes, Broadband, Design.

The bandwidth limitation on the reflection coefficient of circuits containing a reactance limited negative conductance such as a tunnel diode is derived, and the insertion loss method of modern network theory is adapted to the synthesis of low pass ladder equivalents of amplifiers containing these elements. Amplifiers which have a considerable bandwidth advantage over simple single tuned circuits, and which approach the ultimate bandwidth limit as rapidly as possible as the number of passive components is increased, are demonstrated. Fundamental bandwidth limitations of three-frequency nonlinear reactance amplifiers, parametric amplifiers, and non-inverting upconverters are found. A low pass ladder equivalent circuit and the insertion loss method are shown to be useful tools for synthesis of these amplifiers. Considerable bandwidth advantage over single-tuned circuits is again demonstrated. Syntheses which yield the ultimate bandwidth as the number of circuit elements is increased are found. These synthesis methods and the reverse predistortion technique are used to synthesize stable amplifiers whose bandwidth capability increases almost linearly with the number of active elements employed. Relationships between physically achievable amplifier circuits and the low pass equivalents are shown, and the general compatibility of presently available active elements with these circuits is considered. (Author)

PB 156 742 $1.60

Electronic [Tech.] Lab., Wright Air Development [Div.] Wright-Patterson AFB, Ohio.
VOLTAGE BREAKDOWN AT LOW GAS PRESSURES (HIGH ALTITUDE), by James W. Ballard and Charles R. Geesner. Rept. on Improved Electronic Components. July 56, 12p. WADC Technical note 56-304; AD-97 126.

This report released for sale to the public 1 Aug 61.

DESCRIPTORS: *Sparks, Analysis, High altitude, *Electrodes, Separation, Electronic equipment, Test methods, *Voltage.

Voltage breakdown data for spark gaps were obtained for pressures of 746 millimeters of mercury (atmospheric) to .0055 millimeters of mercury, which are representative of altitudes from 500 feet to 300,000 feet. The spark gap consisted of two 1/4-inch aluminum rods with 1/8-inch radius polished ends capable of being separated measured distances. Curves are presented for the spark gap geometry for what value they may have. No attempt was made to simulate atmospheric composition, presence of electrons, ions, ionizing radiations or ambient temperatures in the evacuated bell jar. For a given spark gap separation the curves show a critical pressure corresponding to some altitude for which there will be a minimum voltage breakdown. At about 200,000 feet the breakdown voltage is approximately 350 volts alternating current for gaps between 1/32 inch and 1/2 inch, and is about 430 volts direct current for gaps 1/32 inch to 1/2 inch. These preliminary 'non-refined' experiments indicate procedures and techniques for testing electronic components at high altitudes in which atmospheric characteristics may be simulated to the extent to which they are known and reproducible in the laboratory. (Author)

PB 157 139 $3.60

[Electronics Research Lab., Stanford U., Calif.]
AN ELECTRICAL NETWORK FOR THE STUDY OF ELECTROMAGNETIC FIELDS, by Karl Spangenberg and Glenn Walters. Technical rept. no. 1 on Contract N6-ori-106, T.O. 3. 15 May 47, 31p. 4 refs. ATI-77 655.

This report released for sale to the public 1 Aug 61.

DESCRIPTORS: *Electromagnetic fields, *Electrical networks, Design, Tests, *Wave analysis, Frequency analyzers, Cavity resonators, Configuration, Waveguides.

There is described the design, construction, and testing of an electrical network capable of obtaining solutions of the wave equation in cylindrical coordinates for problems of axial symmetry. The circuit yields information on TEM, $TM_{Om(n)}$, and $TE_{Om(n)}$ modes of concentric lines, resonators, and circular wave guides. Direct information is obtained on electric and magnetic field configurations. In addition, the resonant frequencies of cavities, equivalent impedances, reactance characteristics, and propagation characteristics may be determined. The effect of obstacles, corners, and dielectrics in lines, resonators, and guides is also readily determined. (Author)

PB 155 898 $9.10

Electronics Research Lab., U. of California, Berkeley.
PRODUCTION AND INTERACTIONS OF ELECTRON BEAMS IN CROSSED FIELDS, by C. W. Hartman. Scientific rept. no. 10 on Contract AF 19(604)2270, 31 Oct 60, 104p. 25 refs. IER series no. 60, issue no. 325; AFCRL-TN-60-1126; AD-254 709.

DESCRIPTORS: *Electron beams, Cold cathode tubes, *Cathodes, *Magnetrons, *Cathodes (Electron tubes), Electric fields, *Space charges, Microwave equipment, *Anodes (Electron tubes), Electron tubes, Magnetic effects, Gas ionization, Electrons, Plasma physics, Waveguides, Cavity resonators, *Traveling wave tubes Theory, Harmonic oscillators, Magnetic fields.

Production and turbulence of self-sustained, multimegawatt, crossed-field electron beams are studied in the smooth-anode magnetron with cold cathode. A description of turbulence, based on slipping-stream instabilities resulting from velocity shear in the beam. is formulated in terms of simple diffusion relationships. The theory accounts for cathode bombardment, transverse diffusion, violation of magnetron cutoff, and other observed characteristics and agrees quantitatively with experiment. RF interaction with the high-powerbeams that may be produced is studied for a class of anode structures based upon space-harmonic interaction principles. Several structures are discussed that show promise of obtaining high-efficiency coherent-phase interaction over areas large compared to a wavelength. (Author)

PB 155 807 $2.60

Electronics Research Lab., U. of California, Berkeley.
SUFFICIENT CONDITIONS FOR THE STABILITY OF CERTAIN NONLINEAR CONTROL SYSTEMS, by I. J. Williams. Scientific rept. no. 5 on Contract AF 19(604)5466. 25 Jan 61, 25p. 8 refs. IER series no. 60, issue no. 340; AFCRL-46; AD-254 578.

DESCRIPTORS: *Servo systems, Stability, Control systems, Nonlinear systems, Non-linear differential equations, Functions, Mathematical analysis.

The stability of control systems containing one nonlinear-gain element is investigated. Sufficient conditions for second-order and third-order systems of this type to be asymptotically stable in-the-large are determined through the use of the Lur'e Lyapunov function and the Aizerman linearization. For the second-order case, the restriction on the nonlinear gain is that it be a single-valued function bounded by the linear gains of zero and infinity. For the third-order case, the restriction on the nonlinear gain is that it be a single-valued function bounded by the linear gains of zero and $8\alpha\beta\gamma$ where $-\alpha$, $-\beta$, and $-\gamma$ are the real open-loop pole locations of the system. If $\alpha$, $\beta$, and $\gamma$ are all equal, then the upper bound of $8\alpha\beta\gamma$ corresponds to the maximum linear gain for which the linearized system is stable. (Author)

PB 156 845 $1.10

Electronics Research Lab., U. of California, Berkeley.
TRANSFER FUNCTION SYNTHESIS OF ACTIVE RC NETWORKS, by E. S. Kuh. Rept. on Contracts Nonr-222(74) and N7onr-29529. 25 Aug 60, 7p. 9 refs. Rept. no. 114; IER series no. 60, issue no. 310; AD-245 164.

DESCRIPTORS: *Electrical networks, *Circuits, Synthesis, *Impedance, *Resistance, Grounded emitter amplifiers, *Transistor amplifiers, Series, Mathematical analysis, Functions, Voltage, Transistors.

A general method is found to synthesize voltage transfer functions with complex poles and zeros using RC elements and a practical transistor amplifier. The method allows specified source and load resistances. The over-all network has a common ground and is economical in terms of the number of elements. (Author)

PB 156 102 $9.60

General Electric Co., Syracuse, N. Y.
SYNCHRONOUS DETECTION POINT-TO-POINT TEST. Final engineering rept. July 57-31 Mar 58, on Contract AF 30(602)1730. Apr 58, 113p. 7 refs. RADC-TR-58-89; AD-148 785.

DESCRIPTORS: *Data transmission systems, Tests, *Ionospheric propagation, Ionospheric disturbances, Detection, *Frequency shift keyers, Tests.

A one-way 2000-bit per second data-link system has been developed and tested. The system, referred to herein as the Mercury System, employs the principles of phase-shift keying and synchronous detection. The data link system was operated over a 2500 mile circuit to observe ionospheric effects. In addition a one-way standard FSK teletype link was installed and tested to gather comparative data under the same ionospheric conditions. The test data and performance characteristics for both systems are included and discussed. (Author)

PB 152 509 $17.00

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
TRANSISTOR OSCILLATORS OF EXTENDED FREQUENCY RANGE, by B. J. Dasher and S. N. Witt, Jr. Final rept. 15 Mar 53-31 May 55, on Contract DA 36-039-sc-42712. 30 June 55, 265p. 34 refs. AD-82 523.

This report released for sale to the public 1 Aug 61.

DESCRIPTORS: *Oxcillator circuits, *Transistors, Frequency stabilizers, High frequency, Range, Voltage, Design, *Crystal oscillators.

The principal results of this investigation are: the development and analysis of several transistor oscillator circuits which are stable against voltage variations at frequencies below the alpha cut-off frequency of the transistor; the development of the Groszkowski analysis to a point where it is useful in the design of low-frequency negative-resistance oscillators; the development of a design procedure for feedback oscillators which insures relatively good frequency stabilities; the development of methods of compensating and stabilizing transistor oscillators; the demonstration that several oscillator configurations are not suitable for use with transistors where frequency stability is important; the demonstration that the characteristics of crystals and LC tuned circuits are more important in the design of transistor oscillators than in the design of vacuum-tube oscillators the investigation of transistorized versions of conventional oscillator circuits; the development of circuits for operating transistors as oscillators at frequencies above alpha cut-off; the development of a hypothesis that excellent frequency stability can be obtained only at frequencies well below the alpha cut-off frequency of the transistor to be used; and the development of a few transistor oscillator circuits that surpass the corresponding vacuum-tube circuits in many respects. (See also PB 138 202)

PB 157 142 $15.00

Hi-Q Div., Aerovox Corp., Olean, N. Y.
CAPACITORS (SHAPING) FOR MISSILE AND AIRCRAFT APPLICATION, 160°C AND 350°C, by A. B. Wallace, J. A. Kyser, and L. E. Barker. Final development rept. 7 June 57-31 Mar 60, on Contract NObsr-72711. [1960] 230p. 11 refs. AD-242 366.

This report released for sale to the public 1 Aug 61.

DESCRIPTORS: Capacitors, Electronic equipment, Airborne, *Ceramic capacitors, Ceramic materials, Coatings, Dielectrics, Silicones, Metal films, Manufacturing methods, Tests, Design, Rubber.

The main objective of this investigation was to develop close tolerance capacitors (shaping) to operate at 160°C. and 250°C. for missile and aircraft application. The work involved the development of ceramic dielectrics as well as methods of metallizing, assembly, and protective coatings that will withstand these temperatures. Some of the critical requirements to meet were the high temperature insulation resistance, size, and the stability of the capacitor. Two ceramic compositions were developed: one for use at 160°C. (Phase I) and another for use at 250°C. (Phase II). Methods to produce defect-free films in the order of 3 mils thickness have been developed. Excellent high temperature life test and sequence test results were obtained for the Phase I capacitors. Several formulations with excellent stability at high temperature have been developed but because of their low dielectric constants, they were not used for this contract. Capacitors of .05 mfd to 10 mfd were constructed and evaluated. (Author)

URCL-4954 $2.60

Lawrence Radiation Lab., U. of California, Livermore.
THE MECHANISM OF FAILURE IN CORONA DISCHARGE, by C. D. Nail. Rept. on Contract W-7405-eng-48. 1 Sep 57, 21p.

PB 171 899 $1.50

Lockheed Aircraft Corp., Sunnyvale, Calif.
ELECTROCHEMICAL FUEL CELLS, by Kenneth D. Carroll. Nov 60, 58p. 187 refs. Special Research Bibliography SRB-60-5; AD-251 660.

DESCRIPTORS: Electrochemistry, *Fuel cells, *Electrolytic cells, *Power supplies, Oxidation-reduction reactions, *Bibliography, Spaceships, Satellite vehicles, Storage batteries, Electric propulsion, Propulsion, Solar energy.

The following citations were compiled to present a brief review of the more recent publications on electrochemical fuel cells, redox reactions, regenerative and hydrogen-oxygen fuel cell systems. This introductory bibliography is intended to acquaint one with this general area of study; especially, the rapid increase of reported investigations and applications during the past few years. Items cited were selected largely from the Lockheed Missiles and Space Division materials. Abstracts are given for items unless they were brief news releases or general reviews in journals, or classified documents for which unclassified abstracts were not available. (Author)

PB 171 900 $1.25

Lockheed Aircraft Corp., Sunnyvale, Calif.
ELECTROCHEMICAL FUEL CELLS. PART II: AN ANNOTATED BIBLIOGRAPHY, by Maureen A. Pearcy. Feb 61, 46p. 89 refs. Special Research Bibliography SRB-60-5; AD-253 809.

DESCRIPTORS: Oxidation-reduction reactions, *Fuel cells, *Bibliography, Electrochemistry, Hydrogen, Oxygen, *Power supplies, Solar energy, Electrolytic cells, Electric propulsion, Storage batteries, Spaceships.

This bibliography contains 89 annotated references to the literature of 1960 on fuel cells. The references are arranged alphabetically by author, or title when no specific author is given. The sources consulted include the holdings of LMSD, Technical Information Center, report literature, recent journals, symposia, and conferences. Part I of this bibliography (AD-251 660) presented an introduction to the recent literature on electrochemical fuel cells, redox reactions, regenerative and hydrogen-oxygen fuel cell systems. This part of the bibliography is intended to begin a chronological listing of the fuel cell literature. (See also PB 171 899)

PB 171 902 $2.50

Lockheed Aircraft Corp., Sunnyvale, Calif.
MICROMINIATURIZATION OF PASSIVE NETWORKS. AN ANNOTATED BIBLIOGRAPHY, by A. A. Beltran. Dec 60, 105p. 170 refs. Special Research Bibliography SRB-60-8; AD-251 508.

DESCRIPTORS: *Capacitors, *Resistors, *Subminiature electronic equipment, Electrical networks, *Electronic circuits. *Fixed resistors, *Ceramic capacitors, *Printed circuits, *Subminiature electrical equipment, *Thin films, *Bibliography, *Miniature electronic equipment, *Miniature electrical equipment.

This annotated bibliography, consisting of 170 references, is concerned primarily with distributed parameter networks, null and notch networks, micromodules, microsystem circuits, solid state circuits, and the components and techniques applicable to passive network microminiaturization. (Author)

PB 171 901 $1.25

Lockheed Aircraft Corp., Sunnyvale, Calif.
RADIATION EFFECTS ON ELECTRONIC CIRCUITS, by A. A. Beltran. 31 Aug 60, 48p. 73 refs. Special Bibliography SRB-60-4; AD-250 955.

DESCRIPTORS: *Bibliography, *Radioactivity, *Electronic equipment, *Electronic circuits, *Symposia, Nuclear propulsion, Gamma rays, Radiation effects, Radiation damage, Air force communications, Satellite vehicles, Camera tubes, Fast neutrons, Aircraft, Space flight, Test facilities, Transistors, Semiconductors.

The effects of radiation on electronic circuits, rather than radiation effects on materials and components, is the prime concern of this annotated bibliography. Reports and articles on designing for radiation environments, shielding, reliability, test procedures and results are included. No limitation was placed on the radiation type or environment. The literature on charged and uncharged particles as well as material on space and nuclear engine environments and nuclear detonations was covered. (Author)

PB 154 938 $8.10

Michigan U. Research Inst., Ann Arbor.
STANDING WAVE MEASUREMENTS IN COAXIAL SYSTEMS, by W. M. Nunn, Jr. Technical rept. no. 87 on Contract DA 36-039-63203. Sep 58, 83p. 79 refs. 2262-187-T; AD-205 983.

DESCRIPTORS: *Standing wave ratios, Measurement *Transmission lines, Microwaves, Impedance.

The material presented in this report describes an investigation undertaken to accurately measure large standing wave ratios in lossless coaxial transmission systems. The study was divided into three parts: (1) a literature review; (2) a theoretical analysis; and (3) the development of an experimental procedure. A brief review of the existing methods for determining microwave impedance and standing wave ratio is described first. This is followed by a derivation of the general relations which lead to several important special cases. A description of the experimental procedure is given, after which an analysis of errors is presented.

PB 156 741 $5.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
CODING PROCESSES FOR BANDWIDTH REDUCTION IN PICTURE TRANSMISSION, by A. E. Laemmel. Rept. on Contract W28-099-ac-481. 30 Aug 51, declassified 15 Dec 55. 55p. 10 refs. Rept. R-246-51; PIB-187; ATI-135 119.

This report released for sale to the public 1 Aug 61.

DESCRIPTORS: *Pictures, Television, Transmission, *Facsimile transmission, Coding.

Many pictures have special properties which make it possible to transmit them with a smaller channel capacity than the usual television scanning equations indicate. One such property is that the picture be composed of only black and white elements, and that one is much more numerous than the other. An example would be a simple line drawing on a white background. Several practical scanning methods are analyzed and the channel capacity in both information units and time-bandwidth product required is compared to that needed by the usual television or facsimile scanning methods. The type and amount of error which might be expected from channel noise is also considered. (Author)

PB 155 832 $2.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
STABILITY OF LINEAR NONRECIPROCAL N-PORTS, by Walter Ku. Rept. on Contract AF 19(604)4143. 1 Dec 60, 27p. 8 refs. Research rept. PIBMRI-865-60; AFCRL-80; AD-254 639.

DESCRIPTORS: *Electrical networks, Stability, Impedance, Mathematical analysis, Matrix analysis, *Electronic circuits, Determinants.

A nonreciprocal n-port is defined to be stable if its port currents are zero under all passive terminations. Alternately it can be stated that the n-port is stable if the real part of its driving-point impedances at each of the ports is positive when all the other (n-1) ports are terminated in arbitrary passive impedances. The two equivalent statements of the stability criterion suggest two approaches to study the stability of the nonreciprocal n-port network. The essence of the first approach is to study the stability of the prescribed nonreciprocal n-port by finding a reciprocal n-port having identical stability characterizations. Compact stability criteria have been obtained for a general class of nonreciprocal n-port with its prescribed n x n impedance matrix in the form of a matrix of Jacobi. The symmetrization scheme used can be considered as a generalization of the nonreciprocal 2-port case. The second approach uses the impedance transformation of the n-port to apply the driving-point impedance stability criterion. For a nonreciprocal 3-port, the envelope of the transformation region can be obtained. Furthermore, its stability can be tested using an interative procedure of the bilinear transformation. (Author)

PB 154 488 $11.00

Naval Avionics Facility, Indianapolis, Ind.
NOISE ANALYSIS OF PHASE DETECTORS, by Don Carlin Miller. Rept. on Terrain Avoidance Studies and Associated Radar Techniques. Dec 59, 141p. 7 refs. TP-103; AD-235 444.

DESCRIPTORS: *Phase detectors, *Radar equipment, Radar signals, *Radar interference, *Noise (Radar), *Electronic circuits, Mathematical analysis, Functions, *Signal to noise ratio.

An investigation was made to determine the nature of a radar target output signal in the presence of noise by the use of a statistical approach. The problem is simplified by first investigating the output autocorrelation function for inputs of noise only. This approach makes use of an assumed Gaussian band-limited noise input and analyzes the signals as they pass through the two diodes. Two solutions are found. The first is for linear envelope detection of the diodes and the second for square-law diode operation. The phase detector for both noise and signal inputs is analyzed. Use is made of axis rotation of the statistical coordinate system in order to make it possible to integrate the probability density distributions. The resulting output autocorrelation function is divided into three categories. They are: small signal linear envelope operation, large signal linear envelope diode operation, and square-law operation. Of greatest interest in the phase detector is the output slope-to-noise ratio. This gives a measure of the sensitivity of the system and it depends upon many factors in the system. An analysis is made to investigate the effect of IF amplifier bandwidth on this ratio for various angles of incidence and doppler frequency shift. The results are tabulated. (Author)

PB 155 238 $15.00

Office of Naval Research, Washington, D. C.
INVESTIGATION OF NONLINEAR CONTROL SYSTEMS. PART 1: CONTINUOUSLY ACTING CONTROL SYSTEMS, by Nicholas Minorsky, R. Conti and G. Sansone. Mar 60, 227p. 21 refs.

DESCRIPTORS: *Servomechanisms, Servo systems, Control systems, Mathematical analysis, Stability, Statistical processes.

Contents:
Fundamentals of linear control systems
Investigation of transient process by indirect methods
Linearization
Non linearities of the piece-wise linear type
Self-excited oscillations in control systems
Stability of non linear control systems
Statistical methods in the control theory.

PB 171 676 $1.75

Office of Technical Services, Dept. of Commerce, Washington, D. C.
ELECTRICAL AND ELECTRONIC APPARATUS: GOVERNMENT-OWNED INVENTIONS AVAILABLE FOR LICENSE ACCUMULATED JULY 1958 THOUGH DECEMBER 1960. [1961] 93p. Patent Abstract Series, no. 5, suppl. no. 3.

DESCRIPTORS: *Patents, *Electrical equipment, *Electronic equipment, Design, *Bibliography, *Inventions.

Supplements PB 111 468, Dec 53, PB 111 854, Jan 54-June 55, and PB 151 510, July 55-June 58.

For each invention the title of the invention, the United States Patent number, the name of the inventor, the name of the Government agency adminstering the patent, and an abstract of the patent on the invention are given. Evaluation of the invention with respect to its industrial application is facilitated by an examination of the technical data contained in the abstract.

PB 157 223 $1.60

Ohmart Corp., Cincinnati, Ohio.
STUDY AND DEVELOPMENT OF NUCLEAR BATTERIES, by John Stirnkorb, Edward Kuerze and others. Phase scientific rept. no. 1 on Contract AF 33(616)172. 16 Mar 54, 19p. 1 ref. AD-30 491.

This report released for sale to the public 3 Aug 61.

DESCRIPTORS: *Radioactive batteries, Design, Tests, Theory, Amplifiers, Materials, Electrodes, Temperature.

Nine nuclear cells were constructed with electrode combinations of Cd and Au, Mg and Au, Al and Au, and Al and $PbO_2$. Temperature coefficient tests were made on several of the cells. An automatic zeroing circuit for a d-c amplifier was designed and constructed. The effects of electrode spacing, radiation intensity, and gas pressure were studied theoretically.

PB 155 853 $3.60

Plesset, E. H., Associates, Inc., Los Angeles, Calif.
HIGH RESOLUTION GROUND-BASED SIMULTANEOUS MEASUREMENT OF IONOSPHERIC ELECTRON DENSITY AND COLLISION FREQUENCY, by Frances Richey and R. S. Wehner. Scientific rept. no. 4 on Contract AF 19(604)6187. 31 Jan 61, 35p. 13 refs. C25-61(U)60; TR-107; AFCRL-70; AD-254 861.

DESCRIPTORS: Ionosphere, *Radar, Density, *Radar reflections, Radar signals, Radio signals, *Electrons, Measurement, Radar ranges, *Ionospheric disturbances, High frequency, Microwaves, Modulation.

The feasibility of making high resolution ground-based, simultaneous measurements of ionospheric electron density and collision frequency as rapidly varying functions of time was shown. A system is proposed which utilizes a microwave radar and an HF transmitter and receiver, each at a different location. It is proposed to measure electron density by use of the backscattered return from the radar operating at vertical incidence. Simultaneously the collision frequency at the same point in space is measured by means of the cross-modulation between the microwave and HF systems. Since the transferred absorption depends on the inverse square of the wanted wave frequency, and not on the frequency of the interfering wave, it is possible to utilize the high spatial resolution inherent in a microwave system, degraded somewhat because of the use of the HF system, in regions of normal ionospheric electron density, whereas with a wanted transmitter operating at microwave frequencies, such a measurement is not possible. The spatial resolution obtainable with this proposed system is less than 5 km. The technique is useful in the determination of attenuation, reflection, refraction, etc. of radio waves, or radio wave propagation. (Author)

PB 154 543 $3.60

Raytheon Co., Newton, Mass.
THE FEASIBILITY OF QUICK WARM-UP AND STABILIZATION OF HEATER-CATHODE TYPE RECEIVING TUBES, by Norman E. Linson. Final rept. 1 July 57-31 Dec 58, on Contract NObsr-72718. [1959] 32p. AD-217 020.

DESCRIPTORS: *Cathodes (Electron tubes), Stabilization, Temperature, *Electron tube heaters, Heaters, Electron tubes.

Examination of the factors involved in operation time indicate two approaches, each of which has been experimentally verified. The first is to minimize the heat capacity of the heater-cathode structure by reduction of the amount of material and utilizing good thermal contact between the heater and cathode such as possible with the ceramic sandwich and ceramic cylinder designs. Theoretical computation indicates an operation time of 4 sec with the ceramic sandwich components developed. In the second approach, methods of supplying increased heater power during the initial transient are utilized to obtain quick warm-up comparable to filamentary types. Since this approach does not require direct thermal coupling between the heater and cathode, favorable heater to cathode insulation resistance will be obtained at the operating temperature. Increased power input will be obtained with an auxiliary heater that cuts out when the operating temperature is reached. The switching will be done automatically by a miniature thermostat contained within the tube so that no external circuit changes are required. As a result of the many advantages inherent in the ceramic sandwich design, it is recommended that a prototype model be constructed and evaluated. (Author)

PB 157 169 $15.50

RCA Service Co., Camden, N. J.
ACCELERATED TEST TECHNIQUES, by K. B. Green and R. L. McLaughlin. Final engineering rept. on Contract AF 30(602)1989. 31 May 60, 232p. 24 refs. R-1-60; RADC-TR-60-113; AD-245 502.

This report released for sale to the public 3 Aug 61.

DESCRIPTORS: *Electronic equipment, Tests, Life expectancy, Test methods, *Radio equipment, Radio receivers, Radio transmitters, Maintenance, Reliability, *Communication equipment, *Electron tubes, Resistors, Semiconductors.

This report describes a method of accelerated life testing by increasing the ambient air temperature to 70 degrees Centigrade for equipments that use vacuum tubes, and 60 degrees Centigrade for transistorized equipments. The average accelerated factor for all equipments was 2.3. This was proven by actual tests, both normal and accelerated on five single channel communications equipments, AN/GRR-7/GRT-3, three multi-channel communications equipments AN/GRC-27, and ten transistorized AVR-200 marker beacon receiver equipments. (Author)

PB 155 228 $2.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
EXTRACTION OF INFORMATION FROM A PAIR OF PERIODICALLY VARYING RANDOM WAVEFORMS, by William M. Siebert and Irvin G. Stiglitz (Master's thesis). Final rept. on Contract Nonr-1841(57). 30 June 60, 30p. 10 refs. AD-249 478.

DESCRIPTORS: *Time lag theory, *Wave analysis, Detection, Statistical analysis, Signals, Sources, *Position finding, *Correlation techniques, Theory, Signal to noise ratio

It is necessary in certain systems intended to locate the position of a signal source by triangulation, to have a device whose output is an indication of the time shift between signals received at two or more distinct places. This study applies modern statistical methods to estimate the time shift between a pair of signals that are simultaneously random and periodic in a sense to be described. Two different statistical models for the signal are investigated. The choice of model for a particular situation depends upon the actual signal characteristics. The first and simplest model for a periodic, yet random, signal is a stationary gaussian process with a periodic correlation function. If we assume that the noise is white and gaussian, a system for estimating the time delay is obtained and its performance investigated. The second model represents the signal as a periodically modulated random process. That is, $s(t) = g(t)\,w(t)$, where $g(t)$ is a sample function from a wide-sense stationary periodic random process as above, and $w(t)$ is a sample function from a stationary nonperiodic random process. A system for estimating the time delay is derived. The system is essentially a modification of the standard correlation scheme. (Author)

PB 154 326 $2.60

Rome Air Development Center, Griffiss AFB, N. Y.
COMPARISON OF N-ARY TRANSMISSION SYSTEMS, by Jack K. Wolf. Dec 60, 27p. 5 refs. RADC-TN-60-210; AD-250 293.

DESCRIPTORS: *Digital systems, *Communication systems, *Data transmission systems, Errors, *Coding, Reliability, Mathematical analysis.

The problem of comparing digital communication systems with various size alphabets is considered. A method of comparison is examined where all systems have as their input and final output an identical form of digital data. The systems are then evaluated on the basis of the resulting error rate in the output digital stream. It is found that the relative performance of systems may depend upon the type digital data the systems are to carry. Two particular N-ary transmission systems are examined as examples where such comparisons are required. In the first, N orthogonal signals are used in the transmission alphabet, while in the second, N/2 orthogonal signals and their negatives are used. In both cases, it is assumed that the signals are corrupted by additive, white Gaussian noise and coherent detection is employed. (Author)

PB 154 329 $2.60

Rome Air Development Center, Griffiss AFB, N. Y. DEVELOPMENT TRENDS IN USAF GLOBAL COMMUNICATIONS SYSTEMS IN 1960, by Allan A. Kunze and Charles A. Strom, Jr. Rept. on 480 L System. Dec 60, 25p. 4 refs. RADC-TN-230; AD-250 296.

DESCRIPTORS: *Air force communications, Design, *Radio communication systems, Radio relay systems, Surface to air, Air to surface, Voice communication systems, Data transmission systems, Switching circuits, Ionospheric propagation, Atmosphere, Scattering, Multiplex transmission, Reliability, Digital systems, Telephone communication systems.

This report briefly summarizes the initial systems engineering approach in the development of the 1962-1965 USAF Global Communication System. A brief review is given of early communications effort and the present design philosophy for a 600-voice bandwidth channel, 6000-mile trunk system is discussed. Developments which are intended to provide many of the equipments for this time period are noted. It is concluded that this systems approach will provide the Air Force with a greatly increased communications capability at a total cost which differs little from today's annual expenditures. The systems engineering philosophy is then expanded to ensure a truly reliable communications facility under all conceivable conditions. (Author)

PB 154 328 $1.60

Rome Air Development Center, Griffiss AFB, N. Y. THE INCREASING NEED FOR HIGH SPEED AND RELIABLE DIGITAL COMMUNICATIONS, by Charles A. Strom, Jr. Rept. on 480 L System. Dec 60, 16p. RADC-TN-60-229; AD-250 295.

DESCRIPTORS: Digital systems, *Communication systems, *Data transmission systems, Costs, Reliability, Analysis, *Air force communications, Military requirements.

The trend towards more sophisticated command and control systems, and the application of modern business methods in the control of the vast complex forces in today's Air Force have placed a heavy demand on high speed reliable digital communications. The problem is being vigorously attacked by development agencies within the Air Force and industry and partial solutions for meeting today's requirements are currently available. The optimum solution for each system requires a full analysis of the over-all requirements and a balance between the requirements in the over-all system engineering. Optimum solutions for one system may, of itself, be a poor choice for a second and no single optimum solution is available at this time. Early attention must be given to the data transmission problems or exorbitant reoccurring costs will be experienced in the operation of the system. (Author)

PB 154 255 $3.60

Rome Air Development Center, Griffiss AFB, N. Y. INFORMATION CAPACITY OF CHANNELS USING INTENSITY MODULATION OF LIGHT OR X-RAYS, by Donald E. Savage. Dec 60, 34p. 11 refs. RADC-TN-60-209; AD-249 754.

DESCRIPTORS: *Communications theory, *Communications systems, Light, X-rays, Satellites, Theory, Spaceships, Light communications systems.

In extreme contrast with the classical radiation case, the optimum input probability density distribution in all cases is the pair of delta functions corresponding to the transmitter being full-on or full-off. The capacity of the peak limited channel is finite even when the signal-to-noise ratio is infinite. Infinite capacity for an average limited transmitter was tempered by the results which showed that this infinite result is only obtained with infinite peak-to-average ratio. With not unreasonably large values of peak-to-average ratio, capacity per photon is rather small, for example, 10 nats. As with all capacity formulas, these formulas are upper bounds to the information rates with arbitrarily small error rates transferable through channels having the described properties. Again in contrast to the classical radiation case, it would appear that reasonably efficient codes suitable for a wide range of signal-to-noise ratios can be devised with little difficulty. The method of infinitesimals may prove useful in investigating the aforementioned use of space and frequency for signal (photon) separation. Work also remains to be done on capacities of channels in which an improved quantum mechanical model of the radiation and its effect on detectors is used. (Author)

PB 154 327 $4.60

Rome Air Development Center, Griffiss AFB, N. Y. INTERFERENCE ASPECTS OF FRESNEL REGION PHENOMENA, by Benjamin Lindeman. Dec 60, 42p. 7 refs. RADC-TN-60-214; AD-250 294.

DESCRIPTORS: *Antenna radiation patterns, *Interference, Analysis, Theory, Electronic equipment, Wave transmission.

In order to effectively analyze interference phenomena in high-density electronic environments, a knowledge of antenna radiation in the Fresnel Region is required. A basic intuitive discussion of the physical principles involved as opposed to a rigorous mathematical treatment is provided. Not only is the data in the Fresnel Region required to predict interference, but it provides inputs for measurement techniques and techniques to control or reduce interference as well. The data to be treated are: (1) Comparison between the Fresnel Region pattern and the Far Field pattern in the simplest cases; (2) Variations in signal intensity along the normal axis of an antenna; (3) Effect of terrain on phenomena in the Fresnel Region; and (4) Effect of focusing on antenna patterns in the Fresnel Region. (Author)

SCTM-293-60-52 $2.60

Sandia Corp., Albuquerque, N. Mex. FEASIBILITY OF AN ELECTRICALLY ACTIVATED MINATURE SWITCH, by R. C. Swyers, A. E. McCarthy, and W. C. Jacoby. 30 Aug 60, 26p.

SCTM-8-61-81 $1.10

Sandia Corp., Albuquerque, N. Mex. FIVE-POINT READOUT PANEL FOR THERMOCOUPLE VACUUM GAGES, by L. E. Klaus. Rept. on Contract AT(29-1)-789. May 61, 6p.

PB 157 174 $17.50

Stanford Electronics Labs., Stanford U., Calif.
ON THE STATISTICAL ESTIMATION OF RADAR-SIGNAL PARAMETERS, by D. R. Bennion. Rept. on Contract AF 33(600)27784. 7 May 56, 279p. 21 refs. Technical rept. no. 361-2; AD-93 004.

This report released for sale to the public 4 Aug 61.

DESCRIPTORS: *Radar signals, Radio reception, Statistical analysis, Mathematical analysis, Signals.

The problem of radar-signal reception in the presence of noise is treated by the methods of statistical estimation of parameters. The received signal is assumed to consist of white Gaussian noise added to a simple signal reflection from a single target. The modern formulation of estimation theory is outlined, and some of the more widely recommended procedures of estimation are discussed. Several methods (including the method of maximum liklihood) are demonstrated in connection with the estimation of a single unknown signal parameter. The maximum-likelihood method is further employed, for a number of particular cases, in deriving sets of equations relating estimates of two or more unknown parameters to the received data. In each case, any mechanism that collects the data and solves the set of equations for the desired estimates is an appropriate receiver. The receiving systems implied by the maximum-likelihood method all involve cross-correlating schemes of one sort or another. Asymptotic values of the mean squared error of estimation are derived and tabulated for the various cases considered. (Author)

PB 156 990 $5.60

Technical Research Group, Syosset, N. Y.
STUDY LEADING TO THE DESIGN OF MISSILE-AIR- AND SUBMARINE-BORNE ATOMIC FREQUENCY STANDARD, by R. T. Daly. Final rept. 1 Sep 57-1 Dec 59, on Contract DA 36-039-sc-73282. [1959] 58p. TRG-118-FR; AD-232 251.

DESCRIPTORS: Radiofrequency, Standards, Stability, Airborne, Submarines, *Cesium electron tubes, *Microwave oscillators, Design.

A study of the problem of designing an atomic beam frequency standard for vehicular use was made. This study considered sources of instability in the output signal due to properties of the atomic beam tube, as well as the controlled crystal oscillator. Also, several practical problems associated with the operation of a cesium atomic beam tube in non-laboratory environment were studied experimentally. The results of the instability analysis show that for conditions where the equipment is subjected to vibration, the resulting instability depends only on the transport time delay in the beam tube. Under quiescent conditions, stability is limited by statistical fluctuations in the beam tube signal current. A figure of merit is defined for this effect. In construction and operation of the beam tube a glass envelope and cylindrical focussing magnets were used. Also, a solid source of cesium vapor was incorporated into the beam emitter. (Author)

PB 153 293 $4.60

Transco Products, Inc., Los Angeles, Calif.
DEVELOPMENT OF TYPE C: HIGH-SPEED L-BAND ANTENNA, by Ernst L. Bock. Interim rept. no. 1, 1 July-30 Sep 60, on Contract NOw 60-0144-c. [1960] 49p. 6 refs. AD-249 994.

DESCRIPTORS: *Antennas, L band, Antenna radiation patterns, Impedance, Ultra high frequency, Communication systems, Radio communication systems, Identification systems, Radio navigation, *Airplane antennas, Specifications.

The design of an L-band, external blade, antenna for high speed aircraft is described. The antenna, designated, Type c: High-speed L-band antenna, is a new type blade antenna that is all-metal above the surface on which it mounts. It is conductively connected to the surface on which it mounts through metal support straps, which are part of a special slot excitation network for the vertical antenna comprised of the metal blade. The radio frequency performance of the first development model of the antenna is described by measured radiation patterns and impedance(s), which are made on flat metallic ground planes. The proposed application of the new type blade antenna is UHF communications, and combination UHF and L-band systems is described. (Author)

PB 155 358 $5.60

University of Southern California, Los Angeles.
SPELLED-SPEECH AS OUTPUT FOR AN AUTOMATIC READER, by Milton Metfessel and Constance Lovell. Summary rept. 9 June 55-30 June 60, on Contract V1005M-458. Jan 61, 60p. 10 refs. AD-254 091.

DESCRIPTORS: Automatic, *Reading machines, Electronic equipment, *Blindness, Training, Tests.

The goal of this phase of the investigation has been to develop one or more sets of recorded alphabet sounds which, if used in an automatic reader, would provide: (1) Easy identifiability; (2) Rapid rate (90-180 words per minute); (3) Coalescence (that is, smooth transitions from letter to letter so that words and phrases rather than separate letters become the units of perception); and (4) Acceptable sound quality. More than twenty alphabets have been constructed, each closer to the goal. Obtaining satisfactory coalescence has been the most difficult criterion to meet. An alphabet satisfactory with respect to all four requirements has been achieved. In addition, it has been possible to specify procedures that may be applied in the future for the development of alternative alphabets. Work has also begun on Class II spelled-speech, an abbreviated form that would increase the speed possible with an automatic reader. (Author)

## Ordnance, Missiles, and Satellite Vehicles

PB 153 269 $2.60

Air Proving Ground Center, Eglin AFB, Fla.
HYPERVELOCITY IMPACT FACILITY: LIGHT GAS PROJECTOR, by R. B. Fendick. Nov 60, 25p. 4 refs. APGC-TN-60-102; AD-246 789.

DESCRIPTORS: *Hypervelocity projectiles, *Hypervelocity guns, Ballistic cameras, Test facilities, Pistons, Sabot projectiles, Velocity, Pressure, Helium.

Development efforts on the APGC light gas projector form March to August 1960 were conducted to meet specific test requirements. Investigations of lightweight pistons and faster burning propellant powders resulted in the selection of a piston (4 oz.) and powder which produced a maximum velocity of over 19,000 fps. Hardware life has been extended through development of projectile barrel adapters and lightweight pistons. Saboting techniques to register clean projectile impacts on targets were successful up to 15,000 fps. Minor development efforts with cal .60 projectile barrels resulted in a maximum velocity of 17,000 fps. Attempts to determine peak pressures in the high pressure region indicated possible peak pressure values in excess of 200,000 psi. (Author) (See also PB 147 817)

PB 155 722 $4.60

Army Ballistic Missile Agency, Redstone Arsenal, Ala.
MINIMUM ENERGY REQUIREMENTS FOR SPACE TRAVEL, by Harry O. Ruppe. 10 Nov 59, 43p. 10 refs. Rept. DSP-TR-4-59; AD-230 925.

DESCRIPTORS: *Satellite vehicle trajectories, Orbital flight paths, *Space probes, Velocity, Lunar probes, *Propulsion, Energy, Mathematical analysis.

The minimum energy requirement for many space missions is calculated and expressed as the velocity requirements of the rocket vehicle that is supposed to fulfill them. This gives a possibility for a fast preliminary outline of an optimum vehicle or for an approximation of the payload capability of a given vehicle. Mission flight times can be reduced by utilizing more than minimum energy. This is particularly pronounced in lunar and interplanetary transfers. (Author)

PB 153 066 $11.00

Denver Research Inst., Colo.
FEASIBILITY STUDY FOR A HYPERVELOCITY PROJECTOR, by Eugene S. Grubin, William G. Harrach, and William R. Orr. Final rept. on Contract AF 08(603)4549. Dec 59, 148p. 26 refs. APGC-TR-59-62; AD-230 607.

DESCRIPTORS: *Hypervelocity guns, Interior ballistics, *Laboratory equipment, Design, *Hydrodynamics, *Gas flow, *Thermodynamics, Mathematical analysis, Pressure, *Magnetohydrodynamics, Plasma physics.

This feasibility study describes the basic thermodynamic, hydrodynamic and electrical augmentation principles of a laboratory hypervelocity projector with a theoretical capability of accelerating a 25 grain particle to a velocity of 50,000 fps. A detailed analysis is presented of the propellant gas properties, as a function of time and position, for the nonsteady ballistic expansion of a perfect gas hydrogen column by the conventional method of characteristics. A characteristics solution of the equations of motion for a real, virial gas is developed, and the results are found to diverge appreciably from the perfect gas case. From the initial gas conditions of primary interest, 30,000 atm and 6000°K, the expansion was examined to determine the feasibility of energy addition by electrical means to augment the normally adiabatic process. (Author)

PB 171 681 $0.75

Diamond Ordnance Fuze Labs., Washington, D. C.
GALVANOMETER, BLASTING, T1E2, by Ara Mesrobian. Terminal rept. 20 Mar 61, 21p. 9 refs. Technical rept. TR-915; AD-254 314.

DESCRIPTORS: *Galvanometers, *Detonators, Circuits, Tests, Test equipment, Design, Ordnance.

A pocket-sized checker, capable of indicating a yes/no continuity in circuits containing from one to 50 military or commercially standard blasting caps in series, has been developed and successfully passed all specified tests. This unit -- designated Galvanometer, Blasting, T1E2 -- comprises an electromagnetic pulse generator, a neon-lamp indicator, and a transistor bridge circuit incased in a rugged-type plastic. The overall dimensions are 1-3/4 by 2-1/4 by 5-1/2 in.; the approximate weight is 12 oz. The T1E2 is intended to replace the presently used standardized D'Arsonval instrument which is inadequate for the desired applications because it is (1) too bulky, (2) relatively fragile, (3) unreadable in darkness, and (4) inaccurate at extreme temperatures These deficiencies have been corrected in the T1E2 unit in addition to other improvements that were not accomplished with the T1 and -E1 models. (Author)

PB 171 905 $1.50

Lockheed Aircraft Corp., Sunnyvale, Calif.
MINIMUM WEIGHT ANALYSES AND DESIGN PROCEDURES FOR FLAT, TRUSS-CORE SANDWICH PANELS, by R. F. Crawford, A. B. Burns and L. K. Tilcens. Technical rept. on Flight Sciences, Contract AF 33(616)6905. Aug 60, 57p. 15 refs. LMSD-704009; AD-250 810.

DESCRIPTORS: Sandwich construction, Sheets, Mathematical analysis, *Sandwich panels, Design, Beams, Beryllium, *Airframes, Structures, Stainless steel, Airplane panels.

Minimum weight analyses and design charts are developed for truss-core sandwiches acting as compression panels, wide columns, and shear panels. The analyses account for the load-carrying ability of the core in all cases and the effects of transverse shear stiffness and plasticity in the first two cases. It is shown that in ranges of loading and material properties where truss-core sandwiches have their greatest applicability, transverse shear stiffness has negligible effects. Examples of problems are given. (Author)

PB 156 704 $3.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
TEMPERATURE CONTROL OF SATELLITE AND SPACE VEHICLES. AN ANNOTATED BIBLIOGRAPHY, by Robert C. Gex. Feb 61, 36p. 88 refs. Special bibliography SB-61-5; AD-253 403.

DESCRIPTORS: *Satellite vehicles, *Spaceships, *Temperature control, Space environmental conditions, Heat tolerance, Control systems, Space probes, *Bibliography.

An annotated list of references is given on temperature control of satellite and space vehicles. Methods and systems for maintaining vehicles within tolerable temperature bounds while operating outside planetary atmospheres are included. Discussions of the temperature environment in space and how it might affect vehicle operation are included. Re-entry heating problems are not included. (Author)

PB 154 218 $1.60

Naval Ordnance Lab., White Oak, Md.
A COMPUTER PROGRAM FOR THE ANALYSIS OF TRANSIENT, AXIALLY SYMMETRIC, EXPLOSION AND SHOCK DYNAMICS PROBLEMS, by T. Orlow, D. Piacesi, and H. M. Sternberg. 30 Sep 60, 19p. 7 refs. NAVWEPS rept. 7265; AD-249 661.

This report released for sale to the public 2 Aug 61.

DESCRIPTORS: *Computers, *Programming, *Explosions, Shock, Shock waves, Dynamics, Bubbles, Metals, Gas flow, *Detonation waves, *Hydrodynamics, Compressible flow.

The main features of a high speed computer program for the analysis of transient axially symmetric explosion and shock dynamics problems are described. The hydrodynamic equations determining the material flow are solved numerically by the von Neumann-Richtmyer method. The program contains routines to accommodate slippage along interfaces between dissimilar materials; e.g., it can be used to determine the flow of gaseous explosion products venting from a metal tube. Results are given showing the computed two-dimensiona flow of metals and gases following the detonation of cased solid explosive charges. (Author)

PB 157 245-1 $19.75

Office of Naval Research, Washington, D. C.
SYMPOSIUM ON DETONATION [NO. 3] JAMES FORRESTAL RESEARCH CENTER, PRINCETON UNIVERSITY. SEPTEMBER 26-28, 1960. [1960] 331p. 155 refs. ONR Symposium rept. ACR-52, vol. 1; AD-242 585.

This report released for sale to the public 7 Aug 61.

DESCRIPTORS: *Detonation, *Explosives, Symposia, Explosions, Test equipment, Impact shock, Shock resistance, Pyrolysis, Combustion, Electric currents, Azides, RDX, Pentolite, Electrical conductance, Sensitivity.

Contents: Colliding-ball, high-explosive impact sensitivity testing machine; Photographic study of explosions initiated by impact; Pure environmental shock testing of condensed phases; Memory effect in the thermal initiation of explosives; Thermal decomposition of $[Co(NH_3)_6](N_3)_3$; Behavior of explosives at very high temperatures; Rapid burning of secondary explosives by a convective mechanism; Electrical initiation of RDX; Detonation studies in electric and magnetic fields; Electrical measurements in detonating; Pentolite and Composition B; Electrical conductivity of detonating high explosives; Ionization in the shock initiation of detonation; Chemical factors in external detonation-generated plasmas; Detonation plasma; Energy transfer to a rigid piston under detonation loading; Computer program for the analysis of transient axially symmetric explosion and shock dynamic problems; Pressure profiles in detonating solid explosive; Decay of explosively induced shock waves in solids and spallings of aluminum; Effects of boundary rarefactions on impulse delivered by explosive charge; Experimental determination of stresses generated by an electric detonator; Comments on hypervelocity wave phenomena in condensed explosives; Nonideal detonation of ammonium nitrate-fuel mixtures. (See also PB 157 245-2)

PB 157 245-2 $19.75

Office of Naval Research, Washington, D. C.
SYMPOSIUM ON DETONATION [NO. 3] JAMES FORRESTAL RESEARCH CENTER, PRINCETON UNIVERSITY, SEPTEMBER 26-28, 1960. [1960] 349p. 189 refs. ONR Symposium rept. ACR-52, vol. 2; AD-242 586.

This report released for sale to the public 7 Aug 61.

DESCRIPTORS: *Detonation, *Explosives, Impact shock, TNT, PETN, Sensitivity, Shock resistance, Nitroglycerin, RDX, Symposia, Propellants, Test methods.

Contents: Detonation velocity of pressed TNT; Measurements of detonation, shock, and impact pressures; Low-pressure points on the isentropes of several high explosives; Strong shocks in porous media; Behavior of explosives at impulsively induced high rates of strain; Initiation and growth of detonation in liquid explosives; Initiation characteristics of mildly confined, bubble-free nitroglycerin; Shock initiation of detonation in liquid explosives; Shock initiation of solid explosives; Shock-induced sympathetic detonation in solid explosive charges; Growth of detonation from an initiating shock; Initiation of a low-density PETN pressing by a plane shock wave; Transition from shock wave to detonation in 60/40 RDX/TNT; Determination of the shock pressure required to initiate detonation of an acceptor in the shock sensitivity test; Computational treatment of the transition from deflagration to detonation in solids; Method for determination of detonability of propellants and explosives.

PB 157 061 $6.60

Office of Scientific Research and Development. Div. 2.
MEASUREMENT OF BUBBLE-PULSE PHENOMENA: I. MARK 6 DEPTH CHARGE, TNT LOADED, by C. P. Slichter, W. G. Schneider, and R. H. Cole (Woods Hole Oceanographic Institution). Rept. for Aug 45-Feb 46 on Investigation of Explosives for use in Underwater Munitions, Contract OEMsr-569. Mar 46, declassified 1 Nov 60. 64p. 19 refs. NDRC rept. no. A-364; OSRD rept. no. 6242; ATI-18 449.

This report released for sale to the public 4 Aug 61.

DESCRIPTORS: *Underwater explosions, *Explosion bubbles, Measurement, TNT, Instrumentation, Depth charges, Bubbles, Explosives.

PB 157 060 $9.10

Office of Scientific Research and Development. Div. 2.
THE MEASUREMENT OF UNDERWATER EXPLOSIONS FROM SERVICE WEAPONS AT THE UNDERWATER EXPLOSIVES RESEARCH LABORATORY (UERL), by J. S. Coles. Rept. on Investigation of Explosives for use in Underwater Munitions, Contract

OEMsr-569. Mar 46, declassified. 104p. 25 refs. NDRC rept. no. A-362; OSRD rept. no. 6240; ATI-204 123.

This report released for sale to the public 4 Aug 61.

DESCRIPTORS: *Underwater explosions, Effectiveness, Measurement, *Explosives, Instrumentation.

PB 171 677 $0.50

Office of Technical Services, Dept. of Commerce, Washington, D. C.
ORDNANCE: GOVERNMENT-OWNED INVENTIONS AVAILABLE FOR LICENSE ACCUMULATED JULY 1958 THROUGH DECEMBER 1960. [1961] 41p. Patent Abstract Series, no. 6, suppl. no. 3.

DESCRIPTORS: *Patents, *Ordnance, Design, *Bibliography, *Inventions.

Supplements PB 111 469, Dec 53, PB 111 854, Jan 54-June 55, and PB 151 511, July 55-June 58.

For each invention the title of the invention, the United States Patent number, the name of the inventor, the name of the Government agency administering the patent, and an abstract of the patent on the invention are given. Evaluation of the invention with respect to its industrial application is facilitated by an examination of the technical data contained in the abstract.

PB 154 971 $21.00

Research Lab. for Mechanics of Materials, Mass. Inst. of Tech., Cambridge.
THE STRESS ANALYSIS AND DESIGN OF RADIALLY EXPANDED GUNS, by C. W. MacGregor, L. F. Coffin, Jr. and others. Rept. no. 2 on Contract NOrd 9107-Task F, continuation of Contract NOrd-470. 22 Nov 46, 380p. 6 refs. ATI-105 566.

DESCRIPTORS: *Guns, Design, Stresses, Mathematical analysis, Pressure, Deformation.

Several methods for determining the pressures, stresses and deformations in radially expanded tubes were developed previously. The present report puts that portion of the theory which is applicable to the present Navy method of radial expansion in a convenient form for ready use by designers. The report includes methods of obtaining the radial, tangential and axial stresses and strains present while the pressure is acting at the end of the radial expansion process; methods of obtaining the residual stress distributions present when the expanding pressure is removed; methods of computing pressure-external expansion curves; and finally methods for determining the residual stresses and the resultant strength of the gun after final machining has been performed subsequent to the radial expansion process.

## Ship Building

PB 155 230 $9.10

Davidson Lab., Stevens Inst. of Tech., Hoboken, N. J.
SHIP BEHAVIOR AT SEA. LECTURES ON NEW DEVELOPMENTS AND BASIC PRINCIPLES, HIGHLIGHTED AND ABSTRACTED, by Wilbur Marks. Rept. on Third Summer Seminar Sponsored by Office of Naval Research 13-17 June 60. 9 Jan 61, 107p. 33 refs. AD-250 249.

DESCRIPTORS: *Ships, *Hydrodynamics, *Ocean waves, Hydrofoils, Ship models, Model basins, Motion, Submarines, Control systems, Ship hulls, Hydrofoil boats, Conferences, Symposia, Stability.

Contents: Objectives of research on ship behavior at sea (A panel discussion); Ocean-wave measurements by Wilbur Marks; Hydrofoil craft in waves, by T. Fransis Ogilvie; Full-scale motion studies, by J. S. Goodrich; Model motions and bending moments, by Edward Numata; Directional stability and control of craft in rough seas, by B. V. Korvin-Kroukovsky; Research at MIT on semi-submerged ships, by E. G. Frankel; Research at SIT on semi-submerged ships, by E. V. Lewis and Paul Van Mater; Hydrodynamic coefficients, by Paul Kaplan; and Analysis of model tests in irregular waves, by John Dalzell.

PB 157 211 $2.60

[Davidson Lab.] Stevens Inst. of Tech, Hoboken, N. J
STERN PROPELLER INTERACTION WITH A STREAMLINE BODY OF REVOLUTION, by B. V. Korvin-Kroukovsky. Rept. no. 2 on Contract N6onr-24705. Sep 54, 25p. 24 refs. Rept. no. 544; AD-96 906.

This report released for sale to the public 4 Aug 61.

DESCRIPTORS: *Marine propellers, Wake, Thrust, Ships, Mathematical analysis, *Bodies of revolution, Axially symmetric flow.

The present paper is the second of a series dealing with the calculation of the wake fraction and thrust deduction behind a body having a stern propeller. In Part I the derivation of expressions for the fluid velocities in the propeller inflow are given together with tables and curves of the velocities computed from these expressions. In Part II, the potential flow about the stern of a streamline body of revolution (U. S. Airship Akron) is determined by means of a source-sink distribution, and the resultant surface pressures are compared with published experimental data. A hypothetical propeller installation is then specified, and the effect of the propeller inflow on the sink distribution, and the resultant propeller wake fraction and thrust deduction are computed using calculated data for the potential flow, and using published boundary-layer data for the frictional part of the wake fraction.

# FOOD, HANDLING, AND PACKAGING EQUIPMENT

## Food

PB 155 172 $3.60

[Aerospace] Medical [Div.] Wright Air Development [Div] Wright-Patterson AFB, Ohio.
ALASKAN FIELD TEST OF USAF SURVIVAL RATIONS, by H. L. Buffenbarger. 1951, 31p. AAL Public rept. 28.

DESCRIPTORS: *Military rations, Survival, Alaska, Nutrition

Arctic survival presents many problems concerning equipment and rations. Current bailout kits have allotted space for four (4) of the ST type rations. This amount has been proven to be sufficient for arctic survival periods of ten (10) days, with moderate activity. However, if strenuous activities are required or if longer survival periods are contemplated or become necessary, then the rations presently provided are not sufficient. Even though the ST type ration has been found to be sufficient as stated above, the "X" ration, with its additional calories, resulted in a decrease in body weight loss and provided a safety factor not furnished by the ST ration with its present caloric content. It is felt that the caloric content of the ST type ration could be increased to provide approximately 1000 calories per man per day with only a slight increase in space requirements. The SA-3 ration, with its higher caloric content, substantially reduced the body weight loss during the ten (10) day test period.

PB 171 674 $0.50

Office of Technical Services, Dept. of Commerce, Washington, D. C.
FOOD PRODUCTS AND PROCESSES: GOVERNMENT-OWNED INVENTIONS AVAILABLE FOR LICENSE ACCUMULATED JULY 1958 THROUGH DECEMBER 1960. [1961] 9p. Patent Abstract Series, no. 3, suppl. no. 3.

DESCRIPTORS: *Patents, *Food, Processing, Bibliography, *Inventions, Dehydration, Preservation.

Supplements PB 111 466, Dec 53, PB 111 854, Jan 54-June 55, and PB 151 508, July 55-June 58.

For each invention the title of the invention, the United States Patent number, the name of the inventor, the name of the Government agency administering the patent, and an abstract of the patent of the invention are given. Evaluation of the invention with respect to its industrial application is facilitated by an examination of the technical data contained in the abstract.

## MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

PB 155 053 $5.60

Forest Products Lab., Madison, Wis.
INVESTIGATION OF BARRIERS FOR PACKAGING BEARINGS PRESERVED WITH SYNTHETIC OIL-BASE GREASES, by R. S. Kurtenacker. Rept. on Purchase Order (33-038)-50-1107E. 26 Dec 50, 57p. 1 ref. ATI-114 209.

This report released for sale to the public 20 July 61.

DESCRIPTORS: *Ball bearings, *Packaging, Corrosion inhibition, Coatings, Greases, Preservation, Exposure, Tests, Bearings, Containers.

An investigation was conducted of greaseproof and moisture-vaporproof barriers and synthetic oil base and petroleum oil-base greases when used in the protective packaging of ball bearings. The method of packaging consisted of placing the cleaned and preserved bearing, with and without Grade A greaseproof barriers, in pouches formed from various heat-sealable metal foil barrier materials. A total of 900 packaged bearings were subjected to the cyclic exposure test of Specification AN-P-36 followed by either 30, 90, or 185 days storage at 125°F. and 92 percent humidity. Results indicated that the synthetic oil-base greases have a more deleterious effect on the heat-sealable coating of the metal foil barriers than do the petroleum oil-base greases. Also, the use of suitable Grade A greaseproof barriers tends to retard this action, but a material meeting the requirements of Specification JAN-B-121 is not necessarily a suitable Grade A barrier. The variable performance of the packaged bearings indicated that the behavior of the packaging materials was apparently dependent, to some degree, upon the combination of greases, Grade A greaseproof barriers, and metal foil barriers. (Author)

## Engines and Propulsion Systems

AD-256 916 repriced $5.00

Electro-Optical Systems, Inc., Pasadena, Calif.
ENERGY CONVERSION SYSTEMS REFERENCE HANDBOOK. VOLUME XI. RADIOISOTOPE SYSTEM DESIGN. Rept. on Contract AF 33(616)6791. Sep 60, 316p. 147 refs. (EOS rept. no. 390-Final, Vol. 11; WADD TR 60-699; vol. 11.

DESCRIPTORS: *Power supplies, *Nuclear power plants, *Spaceships, *Space probes, Radioactive isotopes, Generators, Heat exchangers, Thermocouples, Thermoelectricity, Sources, Isotope availability, *Satellite vehicles, Auxiliary power plants, Electromechanical converters, *Radiation hazards, Solar energy, Electricity, Solar cells, Reliability, Fuels, Processing, Energy, Heat transfer, Design, Handbooks.

The Martin Company in Baltimore, has been engaged in extensive research and development work on isotopic-powered generators. A description is presented of their work in basic technology, radiation safety, and specific equipment design. Basic work includes methods of preparation and containment of fuels, energy conversion systems, and generator design principles. Prevailing concern over radiological hazard is answered by discussion of each possible hazard situation from ground handling to various vehicle missions, including aborts. Five practical generator designs are presented including SNAP IA, a 125-watt, one-year generator using Cerium-144, and the Polonium-fueled SNAP III, both of which have progressed to the advanced hardware stage. A comparison of nuclear- and solar-powered generators indicates some advantage for the nuclear device for requirements of less than 1 kwe when the mission involves long periods of flight away from the sun. (Author)

LAMS-2519 $0.50

Los Alamos Scientific Lab., N. Mex.
NUCLEAR ROCKET PROPULSION, comp. by R. W. Bussard. A selected bibliography of the unclassified literature. Rept. on Contract W-7405-eng-36. 17 May 61, 22p.

PB 157 165 $2.60

Space Technology Labs., Inc., Los Angeles, Calif.
PLASMA OSCILLATIONS OF A CONFINED ELECTRON GAS, by Erich S. Weibel. Rept. on Thermonuclear Propulsion Research, Contract AF 04(647)309. 30 July 59, 21p. 13 refs. TR-59-0000-00769; AFBMD Document no. 60-3951.

This report released for sale to the public 3 Aug 61.

DESCRIPTORS: Electrons, Gases, *Plasma oscillations Mathematical analysis, *Nuclear propulsion, Oscillations.

The plasma oscillations of an electron gas which is confined by the potential $V = \frac{1}{2} m \omega_0^2 x^2$ are investigated using the Boltzmann Transport Equation without the collision term. This equation is linearized about the equilibrium distribution $f_0 = \exp(-1/kT)(V + \frac{1}{2} mv^2)$. By expanding the electric field in Hermite polynomials, it is possible to reduce the problem to determining the solutions of an infinite system of linear homogeneous equations for the coefficients of the expansion. Approximate solutions for the lowest two resonant frequencies are found analytically as the roots of a small subdeterminant. (Author)

## Manufacturing Equipment and Processes

PB 171 678 $0.50

Office of Technical Services, Dept. of Commerce, Washington, D. C.
CERAMIC, PAPER, RUBBER, TEXTILE, WOOD, AND OTHER PRODUCTS AND PROCESSES: GOVERNMENT-OWNED INVENTIONS AVAILABLE FOR LICENSE ACCUMULATED JULY 1958 THROUGH DECEMBER 1960. [1961] 13p. 91 refs. Patent Abstract Series, no. 7, suppl. no. 3.

DESCRIPTORS: *Patents, *Materials, Processing, *Bibliography, Ceramic materials, Paper, Rubber, Textiles, Wood, *Inventions.

Supplements PB 111 470, Dec 53, PB 111 854, Jan 54-June 55, and PB 151 512, July 55-June 58.

For each invention the title of the invention, the United States Patent number, the name of the inventor, the name of the Government agency administering the patent, and an abstract of the patent on the invention are given. Evaluation of the invention with respect to its industrial application is facilitated by an examination of the technical data contained in the abstract.

PB 171 672 $1.00

Office of Technical Services, Dept. of Commerce, Washington, D. C.
INSTRUMENTATION: GOVERNMENT-OWNED INVENTIONS AVAILABLE FOR LICENSE ACCUMULATED JULY 1958 THROUGH DECEMBER 1960. [1961] 34p. Patent Abstract Series, no. 1, suppl. no. 3.

DESCRIPTORS: *Patents, *Instrumentation, Design, *Bibliography, *Inventions.

Supplements PB 111 464, Dec 53, PB 111 854, Jan 54-June 55, and PB 151 506, July 55-June 58.

For each invention the title of the invention, the United States Patent number, the name of the inventor, the name of the Government agency administering the patent, and an abstract of the patent of the invention are given. Evaluation of the invention with respect to its industrial application is facilitated by an examination of the technical data contained in the abstract.

PB 171 675 $1.25

Office of Technical Services, Dept. of Commerce,. Washington, D. C.
METAL PROCESSES AND APPARATUS, MACHINERY, AND TRANSPORTATION EQUIPMENT: GOVERNMENT OWNED INVENTIONS AVAILABLE FOR LICENSE ACCUMULATED JULY 1958 THROUGH DECEMBER 1960. [1961] 74p. Patent Abstract Series, no. 4, suppl. no. 3.

DESCRIPTORS: *Patents, *Metallurgy, *Machines, *Transportation, Design, *Bibliography, *Inventions.

Supplements PB 111 467, Dec 53, PB 111 854, Jan 54-June 55, and PB 151 509, July 55-June 58.

For each invention the title of the invention, the United States Patent number, the name of the inventor, the name of the Government agency administering the patent, and an abstract of the patent on the invention are given. Evaluation of the invention with respect to its industrial application is facilitated by an examination of the technical data contained in the abstract.

## MATERIALS

AD-257 731 repriced $3.50

Battelle Memorial Inst., Columbus, Ohio.
INVESTIGATION OF FEASIBILITY OF UTILIZING AVAILABLE HEAT-RESISTANT MATERIALS FOR HYPERSONIC LEADING-EDGE APPLICATIONS. VOLUME VI. DETERMINATION AND DESIGN APPLICATION OF MECHANICAL PROPERTIES OF BARE AND COATED GRAPHITE, by Alfred Rudnick, Robert L. Carlson, and George K. Manning. Rept. for Dec 58-May 60 on Ceramic and Cermet Materials, Subcontract to Bell Aircraft Corp. Contract AF 33(616)6034. Nov 60, 227p. 25 refs. WADC Technical rept. 59-744, vol. VI.

DESCRIPTORS: Mechanical properties, *Brittle materials, Thermal stresses, Fracture (Mechanics), Hypervelocity vehicles, *Graphite, *Silicon coatings, Oxidation inhibitors, High temperature research, *Refractory materials, Hypersonics, Leading edge flaps, Ceramic materials.

The purpose of this contract was to investigate the feasibility of utilizing available heat-resistant materials in the fabrication of leading edges for hypersonic boost-glide vehicles. This volume presents the results of a study on the mechanical properties of a siliconized Grade ATJ graphite. The mechanical properties were studied as functions of temperature (to 2950 F), strain rate, size, and stress state. Supplementary studies were conducted to determine the room-temperature

properties of the uncoated material and the degree of anisotropy of both the coated and uncoated material. Gross variations in the material tended to obscure the effects of the parameters under consideration. Inspection techniques were developed, however, which will reduce these variations. With proper selection of material quality, it is believed that the siliconized Grade ATJ graphite can be used effectively as a structural component at elevated temperature in an oxidizing atmosphere. (Author)

PB 153 233 $5.60

Institute of Rubber Research, U. of Akron, Ohio.
STRESS RELAXATION AND STRUCTURE OF HIGH TEMPERATURE ELASTOMERS, by K. W. Scott, V. R. Allen and others. Final rept. 1 June 58-31 Mar 60, on Contract Nonr-2573(00). [1960] 60p. 18 refs. AD-250 735.

DESCRIPTORS: Amines, Deterioration, Gels, Molecular weight, Molecular structure *Elastomers, Vulcanizates, Stresses, Rubber.

Sol-gel relations in natural rubber vulcanizates have been studied both during network formation and degradation. The experimental values obtained during network formation, deviated markedly from theory, both as to magnitude and by showing an unexpected dependence on the primary chain length. It was shown that this deviation could be attributed to physical crosslinks, resulting from chain entanglements trapped during network formation. The total number of elastically effective chain entanglements per unit volume was found to be a function of the concentration of chemical crosslinks. The effectiveness of a chain entanglement was also found to be a function of the concentration of chemical crosslinks. The theoretical expressions of Horikx (J. Polymer Sci. 19:445, 1956) for network degradation were modified to include the effect of chain entanglements. (Author) (See also PB 153 172)

## Fuels, Lubricants, and Hydraulic Fluids

AD-255 472 $1.50

Aeronautical Engine Lab., Naval Air Material Center, Philadelphia, Pa.
INVESTIGATION OF BEARING LUBRICATION WITH ADDITIVE FUELS, by J. B. Conboy. 26 Apr 61, 52p. 6 refs. NAMC-AEL-1677; Phase B rept. on BUWEPS P. A. no. NAM-RAPP5206.

DESCRIPTORS: *Bearings, *Lubrication, Fuel additives, *Lubricant additives, Tests, Turbojet engines, High temperature research, *Roller bearings, Thin films, Friction, Surface to surface.

The additive fuel lubrication method employing JP-5 fuel plus 1% tri-p-tolyl thiophosphate will satisfactorily lubricate roller bearings at 500 F outer race temperature in turbojet engines. Rig test results predict the feasibility of lubricating roller bearings at 700 F outer race temperature in turbojet engines by the additive fuel lubrication method. (Author)

PB 153 208 $2.60

Aeronautical Engine Lab., Naval Air Material Center, Philadelphia, Pa.
PROPOSED OPTIMUM METHOD OF CONDUCTING CONTAMINATED FUEL TESTS ON ENGINE COMPONENTS PER SPECIFICATIONS MIL-E-5007B AND MIL-E-5009B, by J. A. Avbel and L. C. Doubleday. Final rept. on WEPTASK P. A. NAM-RAPP-32004. 31 Oct 60, 21p. 9 refs. NAMC-AEL-1670; AD-246 150.

DESCRIPTORS: *Aviation fuels, *Jet engine fuels, Contamination, Test methods, Jet engines, Control systems, Fuel meters.

Injection of solid contaminants into the fuel stream in the form of a slurry is preferable to injection of the contaminant in a carrier such as petroleum jelly because of greater ease of handling, better distribution in the test fuel, and elimination of accumulation of the carrier in the fuel supply. Naphthenic acid must be added directly to the main fuel tank in the amount prorated to volume of fuel charge since the acid is completely miscible in the test fluid and cannot be easily removed by mechanical means. Salt water solution must be injected into the fuel stream, either separately or as part of the contaminant slurry. Clean-up filters capable of removing particles down to at least two microns in size are required to reduce the tendency of fine particles to pass through and recirculate, thus gradually increasing in quantity as contaminant is injected. Filters of less than two micron rating may remove enough of the finest particles that changing the test fluid may not be necessary. The better features of the various contaminated fuel test procedures and the results of test work have been combined into a proposed optimum method for running contaminated fuel tests.

PB 157 056 $13.00

Bureau of Mines, Pittsburgh, Pa.
PERFORMANCE CALCULATIONS OF HYDROGEN PEROXIDE AS A MONOPROPELLANT. I. HOMOGENEOUS SYSTEMS, by S. R. Brinkley, Jr., R. W. Smith, Jr. and H. E. Edwards. Rept. no. 13 on Thermodynamics of Combustion Gases, Contract NAonr 97-50. June 53, declassified 15 Dec 53. 184p. 10 refs. Rept. PX3-107/13; AD-15 405.

This report released for sale to the public 1 Aug 61.

DESCRIPTORS: *Hydrogen compounds, Peroxides, Thermodynamics, Rocket fuels, *Propellants, Combustion, Flames, Gases, Temperature, Liquid rocket propellants.

The combustion temperatures, equilibrium composition of products, enthalpies, and rocket-fuel parameters of specified homogeneous hydrogen peroxide systems were computed.

PB 157 143 $1.60

Experiment, Inc., Richmond, Va.
MECHANISMS OF THE AUTODECOMPOSITION OF LIQUID ACETYLENIC MONOPROPELLANTS, by U. V. Henderson, Jr. Progress rept. July-Dec 59, on Contract Nonr-2487(00). 1 Jan 60, 12p. 6 refs. EXP 259; TM-1152; AD-231 505.

This report released for sale to the public 1 Aug 61.

DESCRIPTORS: *Liquid rocket propellants, *Acetylenes, *Pyrolysis, Temperature, Ethers, Vinyl radicals, Aldehydes, Allenes, Allyl radicals, Molecular structure.

Pyrolysis experiments as previously described have been carried out on dipropargyl ether, 1,6-heptadiyne, 1-hexyne, monovinylacetylene, allene, propyne, and diallyl ether. Careful analyses of the pyrolysis products of dipropargyl ether, 1,6-heptadiyne, 1-hexyne, and diallyl ether strongly suggest that these compounds and others like them decompose into two smaller molecules by way of an intramolecular rearrangement such as was proposed for dipropargyl ether. It has been observed that short-chain compounds such as monovinylacetylene, propyne, allene, and propargyl aldehyde do not undergo any significant amount of reaction under the conditions which cause reaction of the longer-chain compounds. Analyses of the trace components in the products of the high-pressure autodecomposition flame indicate that the intramolecular rearrangement also takes place under the autodecomposition conditions. The carbon-14 tracer experiments which has been previously proposed were not carried out because of the failure of the counting equipment to function properly. Although these experiments would have been of interest, the unexpected simplicity of the results that have been obtained reduces the importance of tracer experiments for the elucidation of the decomposition mechanism. (Author)

PB 157 176 $28.50

Propulsion Lab., Wright Air Development [Div.] Wright-Patterson Air Force Base, Ohio.
THERMODYNAMICS OF ROCKET PROPULSION AND THEORETICAL EVALUATION OF SOME PROTOTYPE PROPELLANT COMBINATIONS, by Thomas O. Dobbins Master's thesis. Rept. on Development of Liquid and Solid Rocket Propellants. Dec 59, 723p. 54 refs. WADC-TR-59-757; AD-232 465.

This report released for sale to the public 4 Aug 61.

DESCRIPTORS: *Rocket fuels, *Rocket oxidizers, Rocket propulsion, *Thermodynamics, Enthalpy, Entropy, Combustion, Rocket motor nozzles, Energy, Theory, Liquid rocket propellants, Solid rocket propellants.

This report presents a concise summary of the thermodynamics of rocket propulsion and the evaluation of 100 prototype combinations. Emphasis is placed on the thermodynamics of chemical propulsion and on flow through the converging-diverging nozzle. From this basic theory, two rigorous methods are developed for conducting theoretical performance calculations. One of these utilizes thermodynamic equilibrium constants while the second utilizes a completely new concept of minimizing the total free energy of the combustion products. Sample calculations are presented for each method. Thermodynamic data are presented and discussed for several reactants and all important products of combustion consisting of the elements carbon, hydrogen, oxygen, nitrogen, chlorine, fluorine, lithium, boron, beryllium, aluminum, and magnesium. A rigorous theoretical evaluation is presented for 100 prototype propellant systems. Specific impulse, chamber temperature, exhaust temperature, characteristic exhaust velocity, and chamber molecular weight are plotted as a function of the propellant composition. Also, complete performance data are tabulated for selected fuel-to-oxidizer ratios. (Author)

TID-13079 $3.60

Western Gear Corp., Lynwood, Calif.
EVALUATION OF SOLID FILM LUBRICATED AND UNLUBRICATED GEARS IN DRY HELIUM ATMOSPHERE, by D. J. Fessett. Final rept. on Contract AT(10-1)-925. 30 Apr 61, 34p. Rept. no. 614-137.

## Plastics

AD-255 916 repriced $0.75

Aeronautical Chart and Information Center, St. Louis, Mo.
SCRIBING ON COATED PLASTICS. Rev. of Engraving on Coated Vinylite, Dec 52, Rev. Feb 61. 21p. ACIC Technical rept. no. 3(Rev.).

DESCRIPTORS: *Mapping, Materials, *Plastics, Effectiveness, *Photoengraving.

PB 155 960 $3.60

Aeronautical Materials Lab., Naval Air Material Center, Philadelphia, Pa.
DEVELOPMENT AND FORMULATION OF EXPERIMENTAL DIISOCYANATE-BASED LAMINATING RESINS, by A. P. Bonanni. Progress rept. no. 3, June 58-Feb 60. 22 June 60, 35p. 5 refs. Rept. no. NAMC AML 1133; Proj. no. TED NAM AE 4420; Pt. 3; AD-240 410.

This report released for sale to the public 1 Aug 61.

DESCRIPTORS: *Laminates, *Resin adhesives, Glass textiles, Urethanes, Polymers, Resins, Physical properties, Mechanical properties, Elasticity, Adhesives, Cyanates.

Experimentation has revealed that a laminate having a maximum flexural strength and high flexural modulus of elasticity (flexural modulus) is obtainable with a polyurethane resin formulated from an unsaturated glycol containing four carbon atoms. Changes were noted in the flexural strength and flexural modulus resulting from the use of different laminating temperatures and pressures. The experimental data indicate that a urethane laminate with optimum structural properties is obtained with a laminating pressure of 30 psi and caul-plate temperature ranging from 300° to 350°F. The urethane laminate, formulated with a four carbon unsaturated glycol and 2,4-tolylene-diisocyanate (TDI), has structural properties which are in most cases better than those of laminates prepared with commercial resins of different types. A laminate with a urethane resin content of 23% gave an ultimate flexural strength of 89,700 psi and a flexural modulus of $5.04 \times 10^6$ psi in comparison to a flexural strength of 86,500 psi and flexural modulus of $4.8 \times 10^6$ psi for an epoxy resin having a resin content of 24.5% or to one with a flexural

strength of 84,900 psi, flexural modulus of $4.14 \times 10^6$ psi and a resin content of 27.2%. Laminates made with an epoxy and phenolic resin formulation showed a lower flexural value with a lower resin content. Since experimental polyurethane laminating resins have a pot-life of about 5 to 6 hours, the laminates with these resins were laid up immediately after the resins were synthesized. (Author)

PB 155 347 $2.60

Naval Ordnance Lab., White Oak, Md.
PROPOSED REVISION OF SPECIFICATION REQUIREMENTS FOR 181 STYLE GLASS FABRIC REINFORCED PLASTICS, by P. W. Erickson. 4 Aug 59, 27p. NAVORD rept. 6705; AD-231 119.

DESCRIPTORS: *Glass textiles, Specifications, *Plastics, *Laminates, *Epoxy resins, *Phenolic resins, Bonding, Finishes, *Esters.

Ultimate flexural, tensile and compressive strength data are reported for laminates fabricated from style 181 cloth treated with A-172, A-1100 and NOL-24 finishes and bonded with polyester, epoxy and phenolic resins. Moduli in flexure and tension are also shown. Data were obtained over a range of resin contents varying from 27.6% to 38.5%. It was found in almost all instances that the strength values obtained were considerably in excess of present specification minimum requirements. A proposal is made that rather than to change present applicable specifications, new ones be written for high strength, high quality laminates. These data are submitted as a basis for developing new specification strength requirements. (Author)

PB 155 312 $2.60

Pasteur Inst. (France).
HYDROPHOTOGRAPHIC STUDIES ON THE PERMEABILITY OF PACKAGING MATERIALS TO WATER AND MOISTURE, by Joseph Sivadjian. Final technical rept. no. 1, 1 Feb 60-31 Jan 61, on Contract DA 91-591-EUC-1394. 31 Jan 61, 24p. 3 refs. AD-253 046.

DESCRIPTORS: *Packaging, *Plastics, Films, Water, Moisture, *Polymers, *Ethylenes, Humidity, Temperature, *Plasticizers, Aging, Radiation effects, Gamma rays, Test methods, Phthalates, Moistureproofing.

A hydrophotographic method is described which was utilized for studying the water permeability of plastic films; different factors, such as plasticizers, gamma radiation, temperature, which affect the permeability are considered. The presence of plasticizer increases the permeability of the plastic film to water, while aging lowers it. Gamma irradiation of polyethylene increases the permeability of the plastic film. More humidity was absorbed by the plastic films as their thickness was increased.

## MATHEMATICS

BNL-669 $0.50

Brookhaven National Lab., Upton, N. Y.
A COMPARISON OF SOME ONE-VELOCITY TRANSPORT APPROXIMATIONS IN LATTICES, by Y. Fukai. May 61, 10p.

AD-256 573 $1.60

Carnegie Inst. of Tech., Pittsburgh, Pa.
CRITIQUE OF PROOFS OF THE TWO DIMENSIONAL WULFF THEOREM BY MEANS OF THE CALCULUS OF VARIATIONS, by W. W. Mullins and R. F. Sekerka. Research rept. no. 1 on Contract [DA 36-034-ORD-2794]. 7 June 60, 15p. 6 refs. OOR 2320:2.

DESCRIPTORS: *Calculus of variations, Integration, Differential equations, Crystals, *Solid state, *Mathematics.

Several assumptions and limitations are discussed of proofs of the two dimensional Wulff theorem by means of the calculus of variations. The phases of the discussion are outlined: the problem of convexity, an initial limitation, the solution, the results of Burton (Phil. Trans. Roy. Soc. 243, 351, 1951), choice of origin, uniqueness, and contradiction.

PB 155 232 $1.60

Hebrew U. (Israel).
DEGREE OF DIFFICULTY OF COMPUTING A FUNCTION AND A PARTIAL ORDERING OF RECURSIVE SETS, by Michael O. Rabin. Technical rept. no. 2 on Contract [N]62558-2214. 25 Apr 60, 20p. 5 refs. AD-250 784.

DESCRIPTORS: *Functions, *Functional analysis, Mathematical logic, Algebra.

An attempt to measure the amount of work inherent in the task of computing a given computable (recursive) function is presented. A notion of degree of difficulty of computing a function is introduced and studied. The notion is invariant in the sense that it is independent of the idealized computers (Turing Machines) used for computing the functions in question. Applications are made to the classification of solvable decision problems (recursive sets) according to relative difficulty. (Author)

PB 171 903 $2.50

Lockheed Aircraft Corp., Sunnyvale Calif.
CHARACTER RECOGNITION DEVICES FOR ELECTRONIC COMPUTERS. AN ANNOTATED BIBLIOGRAPHY, by K. D. Carroll. Nov 60, 102p. 311 refs. Special Research Bibliography SRB-60-11; AD-251 661.

DESCRIPTORS: *Reading machines, *Machine translation, *Data processing systems, *Bibliography, *Digital computers, Reasoning, Learning, Perception, Theory, Design.

The literature covering theory, design, equipment and applications of machines that perceive, learn, think

and make reasonable inferences or learn to perform acts of skill is presented. These include learning machines, reading machines and machines capable of speech recognition. The period is primarily from 1954 to the present. (Author)

PB 155 648 $6.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
AMBIT REALIZATION OF CUT-SET MATRICES INTO GRAPHS, by S. Okada and K. P. Young. Rept. on Contract AF 19(604)6620. 21 Nov 60, 65p. 57 refs. Research rept. PIBMRI-801-60; AFCRL-TN-60-1177; AD-254 450.

DESCRIPTORS: *Matrix algebra, Numerical methods and procedures.

A general graphical method of realizing any given cut-set matrix into all possible connections is established. The characteristics of the reduced connection matrices lead to realization of ambits of semi-diagonalized cut-set matrices without crossing. Each terrace, namely, the difference between an ambit area and its all inner ambit areas, corresponds to a node. The graphical method, the logical method, and the matrix algebraic method are established by these. If a cut-set matrix is realizable, so are its subsets. Step-by-step realization is independent of realizing order. Each step corresponds to a stretching, inverse of shrinking. In the matrix method, a desirable expression of traverse of a chord through ambits is obtained by operating the modulo 2 cut-set matrices with modulo 0 arithmetics. (Author)

PB 156 261 $2.60

New York State Coll. of Agriculture, Cornell U., Ithaca.
MIXTURES OF TWO BINOMIAL DISTRIBUTIONS, by Wallace R. Blischke. Technical rept. no. 1 on Contract Nonr-401(39). July 60, 22p. 5 refs. AD-248 452.

DESCRIPTORS: Statistical analysis, *Statistical distributions, Numerical methods and procedures, Binomials.

In the theory of mixtures of distributions, two types of problems are discussed: (1) the problem of identifiability, i.e., given that a population, f, is composed of a mixture of two or more distributions, is the mixture unique; and (2) the problem of estimation, i.e., given that a mixture is identifiable, how shall the parameters of the individual distributions comprising the mixture and the mixing parameters be estimated. (Author)

PB 156 285 $1.10

[Washington U., Seattle].
ASYMPTOTIC DISTRIBUTION OF THE EIGENVALUES OF THE LOWER PART OF THE SCHRODINGER OPERATOR SPECTRUM, by F. H. Brownell and C. W. Clark (Doctoral thesis). Rept. on Contract [Nonr-477(20)]. [July 58] 10p. AD-214 097.

DESCRIPTORS: *Operators (Mathematics) *Integral equations, Measure theory.

PB 153 738 $1.10

Brown U. Div. of Applied Mathematics, Providence, R. I.
EXTENSION OF NADAI'S SAND HILL ANALOGY TO MULTIPLY CONNECTED CROSS SECTIONS, by M. E. Gurtin. Technical rept. no. 54 on Contract Nonr-562(10). Mar 60, 5p. 2 refs. C11-54.

DESCRIPTORS: *Plasticity, Stresses, Cylindrical bodies *Torque, Mathematical analysis.

PB 156 839 $2.60

Institute of Engineering Research, U. of California, Berkeley.
AN EXTENSION OF DUHAMEL'S ANALOG TO PLASTICITY, by S. A. Murch. Technical rept. no. 10 on Contract Nonr-222(69). Aug 60, 23p. 13 refs. Series 131, issue 10; AD-246 562.

DESCRIPTORS: *Plasticity, Deformation, Mathematical analysis, Thermal stresses; Theory.

Duhamel analogy of classical elasticity theory is shown to be extended without modification to the incremental theory of plasticity, when the loading function is temperature independent. For a class of temperature dependent loading functions the analogy of the Duhamel type is shown to hold; (1) when the temperature field is stationary; (2) for problems in which the elastic and plastic components of strain individually satisfy compatibility; or (3) when the material is rigid plastic, provided the medium is interpreted as nonhomogeneous. Examples of particular correspondences are discussed. It is also noted that for linear viscoelastic materials which are elastic dilatational the transformations in the analogy are identical to those for elasticity. (Author)

PB 156 840 $2.60

Institute of Engineering Research, U. of California, Berkeley.
ON THE TIME DERIVATIVE OF TENSORS IN MECHANICS OF CONTINUA, by P. M. Naghdi and W. L. Wainwright. Technical rept. no. 11 on Contract Nonr-222(69). Aug 60, 30p. 9 refs. Series 131, issue 11; AD-246 563.

DESCRIPTORS: Applied mechanics, Stresses, Mathematical analysis, *Tensor analysis, *Transformations (Mathematics), Partial differential equations, *Continuum mechanics.

A single general expression is derived for the time derivative (or the time rate) of tensors, valid in all curvilinear coordinates, and applicable to any tensor fields (representing the variables of state in mechanics of continua) whose transformation law is known a priori. The derived time derivative of a tensor is necessarily dependent on the transformation connections (which occur in the transformation law) of the tensor in question, and in particular obeys the same transformation law as the tensor itself. If the rate of a tensor (such as the stress rate) is suitably defined, then (for a suitable representation of stress) the following conditions are fulfilled: (1) the stress rate vanishes when the medium

executes rigid motion alone and when the stress is referred to a coordinate system participating in this motion, and (2) the rate of invariants of the stress tensor is stationary when the stress rate vanishes. (Author)

PB 154 496 $3.60

Naval Ordnance Lab., White Oak, Md.
THE USE OF RATIONAL APPROXIMATIONS IN THE CALCULATION OF FLOWS WITH DETACHED SHOCKS, by A. Van Tuyl. 16 Nov 59, rev. 14 Apr 60, 33p. 21 refs. Mathematics Dept. rept. M-5; NAVORD rept. 6679; AD-232 294.

DESCRIPTORS: *Blunt bodies, *Shock waves, *Gas flow, Mathematical analysis, Taylor's series.

A method of solution of the inverse blunt body problem is to expand the flow variables behind the given bow shock wave in the neighborhood of a point of the shock, usually chosen to be the nose. However, numerical calculations by M. D. Van Dyke [Journal Aero/Space Sci., 25:485-496, 1958 and NASA report 1, 1959] in the axially symmetric case indicate that these series do not converge at the body. The present analysis shows that certain sequences of Padé fractions obtained from the power series seem to converge at the body, and can be used for calculation of the flow. Calculations by this method are carried out in the case of a paraboloidal shock in a perfect gas with free stream Mach number $M=2$, and $\gamma=7/5$. The starting point of the calculation is the Taylor series for the stream function in the neighborhood of the nose of the shock. The body shapes behind a paraboloidal shock obtained for different values of M and $\gamma$ are in good agreement with numerical calculations, but the pressure on the body is given accurately only for small values of $\gamma-1$ and $M^{-2}$. (Author)

## Aerodynamics and Pneumatics

PB 153 028 $5.60]

Douglas Aircraft Co., El Segundo, Calif.
TABLES OF FLOW FUNCTIONS FOR A SIMPLE NON-STEADY EXPANSION WAVE, by A. Roshko and M. Rubinstein. 1 Sep 60, 59p. 4 refs. Rept. no. ES 40031; AD-246 728.

DESCRIPTORS: Tables, Fluid flow, *Shock waves, *Compressible flow, Thermodynamics, Differential equations.

The nature of a non-steady expansion wave and its equations are reviewed. Tables and charts of twelve functions of a non-steady expansion wave are presented for both gamma equal to 7/5 and 5/3 using the dimensionless flow speed as the independent parameter. (Author)

PB 171 919 $1.25

Heat Transfer Lab., U. of Minnesota, Minneapolis.
MEASUREMENT OF TEMPERATURE PROFILES IN LAMINAR AND TURBULENT AXISYMMETRIC BOUNDARY LAYERS ON A CYLINDER WITH NON-UNIFORM WALL TEMPERATURE, by E. R. G. Eckert, Roger Eichhorn, and Thomas L. Eddy. Rept. on Research on Aerodynamic Flow Fields, Contract AF 33(616)5528. Dec 60, 48p. 6 refs. ARL Technical note 60-161; AD-252 679.

DESCRIPTORS: *Auxially symmetric flow, Heat transfer, *Laminar boundary layer, Surface temperatures, *Turbulent boundary layer, *Cylindrical bodies, *Temperature, Measurement.

Temperature profiles were measured on several stations along the surface of a cylinder with circular cross-section in an air flow parallel to the cylinder axis. Laminar and turbulent boundary layers were investigated. The surface temperature was made to vary along the cylinder by appropriate electric heating of the cylinder shell. Two variations of the surface temperature were investigated. One was obtained by applying electric heating to a zone near the cylinder nose. An unheated zone behind the heated one encountered heat transfer conditions similar to film cooling. The second variation of the surface temperature was obtained by two heated zones with an unheated region in between. Temperature profiles within the boundary layer were measured with an especially designed probe. The shape of the temperature profiles varied considerably along the model length and was, over larger portions, quite different from the shape which the temperature profile assumes on a model with constant surface temperature. This variation was especially pronounced in a laminar boundary layer but clearly recognizable in a turbulent boundary layer as well. (Author)

PB 156 959 $3.60

Lockheed Aircraft Corp. Sunnyvale, Calif.
THE COMPRESSIBILITY TRANSFORMATION AND THE TURBULENT BOUNDARY LAYER EQUATIONS, by O. R. Burggraf. Technical rept. on Flight Sciences. Mar 61, 32p. 14 refs. LMSD-895080; AD-253 808.

DESCRIPTORS: *Turbulent boundary layer, Gas flow, *Compressible flow, *Aerodynamics, Fluid mechanics, Thermodynamics, Heat transfer, Shear stresses, *Transformations (Mathematics).

The compressibility transformation first introduced by Dorodnitzyn (Doklady Akad. Nauk., S. S. S. R., 34:8, 1942; Prikladnia Matematika i Mekhanika, S. S. S. R., 6, 1942) applied to the equations of the turbulent boundary layer on a flat plate, considering heat transfer and arbitrary Prandtl numbers. Assuming the shear distribution to be invariant under the transformation, the stream function and the momentum equation take the proper form for incompressible flow, allowing the use of incompressible velocity profiles in the transformed coordinates. Application of Crocco's method to the transformed energy equation permits integration of the energy equation resulting in a formulism remarkably similar to that proposed by Eckert. Finally, the reference condition was chosen to correspond to the edge of the sublayer from considerations of the assumptions made regarding the shear stress distribution. With this choice, the reference enthalpy is in good agreement with Eckert's formula (J. Aeronaut. Sci., 22:585-587, 1955) over the ordinary range of test conditions. In view of these results, the analysis may be considered to provide a theoretical basis for the reference enthalpy method. (Author)

PB 157 141 $4.60

Michigan U. Research Inst., Ann Arbor.
THE EFFECT OF WALL BOUNDARY LAYER ON THE DIFFRACTION OF SHOCK WAVES AROUND CYLINDRICAL AND RECTANGULAR OBSTACLES, by R. N. Hollyer and R. E. Duff. Rept. on Contract N6-onr-232, T.O. 4. 21 June 50, 41p. 2 refs. Rept. no. 50-2; ATI-93 085.

This report released for sale to the public 3 Aug 61.

DESCRIPTORS: *Shock waves, Diffraction, *Fluid flow, *Boundary layer, Laminar boundary layer, Cylindrical bodies, Shock tubes.

Portions of this report will not reproduce well.

AD-256 234 repriced $2.50

Michigan U., Ann Arbor.
EFFECTS OF COOLING ON TRANSITION IN THE BOUNDARY LAYER ON A HEMISPHERE IN SIMULATED HYPERSONIC FLOW, by Roger Dunlap and A. M. Kuethe. Rept. on Aerodynamic Flow Field, Contract AF 33(616)6856. Feb 61, 116p. 50 refs. ARL-15.

DESCRIPTORS: *Boundary layer, Turbulent boundary layer, Laminar boundary layer, Temperature, Model tests, Bodies of revolution, *Blunt bodies, *Turbulence, *Hypersonic flow, Pressure, Velocity, Heat transfer, Mathematical analysis, *Cooling, Aerodynamics.

A study was made to investigate the effects of cooling on transition in the boundary layer on the nose of a 9-inch diameter hemisphere in simulated hypersonic flow, with the aim of gaining some knowledge of the circumstances under which boundary-layer cooling may promote a reduction in transition Reynolds number (transition reversal). The influences of cooling in increasing the stability to Tollmien-Schlichting type disturbances, in decreasing any stabilizing effects of convex curvature, and in increasing the magnitude of disturbances from fixed roughness elements, are discussed. (Author)

PB 155 346 $4.60

Naval Ordnance Lab., White Oak, Md.
HEAT TRANSFER IN DISSOCIATED AIR BY A TWO-THICKNESS INTEGRAL METHOD. PART I. STAGNATION POINT HEAT TRANSFER, by John O. Powers and Edgar Krahn. 24 Sep 59, 48p. 15 refs. Aerodynamics Research rept. no. 65; NAVORD rept. 6673; AD-239 608.

This report released for sale to the public 1 Aug 61.

DESCRIPTORS: *Laminar boundary layer, Differential equations, Integral equations, Theory, *Heat transfer, Gas flow, Hypersonics.

A theoretical investigation of the compressible laminar boundary layer including the effects of dissociated air in equilibrium was conducted by a 2-thickness integral method. The method was used for determining stagnation point heat-transfer and boundary-layer characteristics at pressures near one atmosphere and for wall and stream temperatures ranging from 400°R to 3,000°R and 600°R to 14,000°R, respectively. Comparison with the theory of Fay and Riddell indicates agreement for stream temperatures up to 10,000°R. Differences, which increase with increasing temperature, approach 30% at a temperature of 14,000°R. The stagnation point results imply that the general application of the present method to blunt bodies of revolution is valid and also indicate areas of potential refinement. (Author)

PB 156 514 $3.60

Naval Ordnance Lab., White Oak, Md.
THERMODYNAMIC PROPERTIES AND ONE-DIMENSIONAL FLOW OF A PARTIALLY IONIZED MONATOMIC GAS, by J. Pomerantz, E. H. Winkler, and A. E. Seigel. 2 Feb 56, 32p. 14 refs. Aeroballistic Research rept. 328; NAVORD rept. 4222; AD-142 576.

This report released for sale to the public 2 Aug 61.

DESCRIPTORS: *Gases, *Gas flow, *Gas ionization, Thermodynamics, Shock waves, Hypersonic wind tunnels.

Ionization is one of the real gas effects which characterize very high-speed flows past missiles upon reentry into the upper atmosphere. The present most suitable test facility for producing flows in which ionization takes place is the hypersonic shock tunnel. The effects of ionization upon the flow past high-speed missiles may be studied most advantageously, without the complicating effects of vibrational excitation and dissociation, by using a monatomic gas instead of air in laboratory tests. The use of monatomic gases has the additional advantage of facilitating the performance study of the hypersonic shock tunnel. Formulae are presented for the calculation of the thermodynamic properties and the one-dimensional flow of a monatomic gas which becomes partially singly ionized and electronically excited. Equations are given for the isentropic flow and for the conditions across a normal shockwave under the assumption that radiation losses can be neglected. Graphs are presented to illustrate the effect of ionization on the Mach number, the pressure, and the speed of sound. (Author)

## Hydrodynamics, Hydraulics, and Hydrostatics

PB 156 869 $4.60

California Inst. of Tech., Pasadena.
SWIMMING OF A WAVING PLATE, by T. Yao-tsu Wu. Rept. on Contract Nonr-220(35). Aug 60, 41p. 11 refs. Rept. no. 98-1; AD-247 414.

DESCRIPTORS: Swimming, Fishes, Propulsion, Sheets, Water, Wave analysis, *Hydrodynamics, Oscillation, Motion, Fluid flow.

A study was made of the basic principle of fish propulsion. As a simplified model, the two-dimensional potential flow over a waving plate of finite chord is treated The solid plate, assumed to be flexible and thin, is capable of performing the motion which consists of a progressing wave of given wave length and phase velocity along the chord, the envelope of the wave train being an arbitrary function of the distance from the leading edge. The problem is solved by applying the general theory for oscillating deformable airfoils. The thrust, power

required, and the energy imparted to the wake are calculated, and the propulsive efficiency is also evaluated. As a numerical example, the waving motion with linearly-varying amplitude is carried out in detail. Finally, the basic mechanism of swimming is elucidated by applying the principle of action and reaction. (Author)

PB 156 260 $2.60

Hydrodynamics Lab., Calif. Inst. of Tech., Pasadena.
ON THE MECHANISM OF CAVITATION DAMAGE BY NON-HEMISPHERICAL CAVITIES COLLAPSING IN CONTACT WITH A SOLID BOUNDARY, by Charl F. Naudé and Albert T. Ellis. Rept. on Contract N123(60530)24917A. July 60, 24p. 9 refs. Rept. no. E-108.7; AD-246 032.

DESCRIPTORS: *Hydrodynamics, *Cavitation, Jets, Deformation, Differential equations, Solids, Stresses, Bubbles.

A perfect fluid theory, which neglects the effect of gravity, and which assumes that the pressure inside a cavitation bubble remains constant during the collapse process, is given for the case of a non-hemispherical, but axially symmetric cavity which collapses in contact with a solid boundary. The theory suggests the possibility that such a cavity may deform to the extent that its wall strikes the solid boundary before minimum cavity volume is reached. High speed motion pictures of cavities generated by spark methods are used to test the theory experimentally. Agreement between theory and experiment is good for the range of experimental cavities considered, and the phenomenon of the cavity wall striking the solid boundary does indeed occur. Studies of damage by cavities of this type on soft aluminum samples reveals that pressures caused by the cavity wall striking the boundary are higher than those resulting from a compression of gases inside the cavity and are responsible for the damage. (Author)

PB 156 739 $5.60

Reed Research, Inc., Washington, D. C.
EFFECTIVE WAKE AND THRUST DEDUCTION FOR DEEPLY SUBMERGED BODIES. THE INFLUENCE OF BODY SHAPE VARIATION ON THE THRUST DEDUCTION COEFFICIENT, by Raul R. Hunziker. Final rept. III on Bureau of Ships Fundamental Hydromechanics Research Program, Contract Nonr-1445(00). 30 Aug 56, 57p. 31 refs. AD-119 589.

This report released for sale to the public 1 Aug 61.

DESCRIPTORS: Hydrodynamics, *Submarine hulls, *Marine propellers, Underwater propulsion, Mathematical analysis, Configuration, Vortices, Wake, Thrust.

The hydrodynamic interaction of a hull-propeller combination moving at a great depth under the free surface is analyzed. On the basis of Oseen's form of the motion equations, Euler theorem, and Lagally's exterior theorem for a stream with singularities at a finite distance from a closed body, a general expression for the thrust deduction fraction $\Theta$, which is also valid for highly loaded propellers, is derived. It is proved that the corresponding velocity field is that of a system of free helical vortices shed by a propeller of an infinite number of blades. In the limiting case of very light loading, the thrust deduction expression is reduced to a generalization of Fresenius' expression. The application of the theory to the ovoid hull combinations tested by Weitbrecht gives values of $\Theta$ lower than the measured ones. This confirms the opinions of Dickmann and van Manen that for the case of radial symmetry the frictional thrust deduction is small. By introduction of the correction that takes into account the finite number of blades, it is possible to apply these results to the problem of propeller adaptation and propulsion economy. Numerical results for different configurations of a prolate ellipsoid hull and propeller are presented in tabular form. The results indicate that the thrust deduction fraction exhibits a rapid diminution with the increase of the distance of the propeller from the stern and with the increase of propeller diameter. (Author)

## METALLURGY

ANL-6325 $0.50

Argonne National Lab., Ill.
SEAM-WELDED TUBULAR FUEL ELEMENTS FOR USE IN CP-5, by L. C. Hymes. Rept. on Contract W-31-109-eng-38. May 61, 9p.

TID-4005(Pt. 1, 6th Ed.) $2.75

Atomic Energy Commission. Div of Research, Washington, D. C.
SUMMARIES OF THE USAEC BASIC RESEARCH PROGRAMS IN METALLURGY, SOLID STATE PHYSICS AND CERAMICS, ed. by R. J. Allio. June 61, 270p.

NAA-SR-5616 $0.75

Atomics International, Canoga Park, Calif.
FABRICATION MODIFICATION DEVELOPMENT FOR OMRE THIRD CORE LOADING, by E. Peters and M. H. Binstock. Rept. on Contract AT(11-1)-GEN-8. 15 July 61, 32p.

TID-13058 $1.10

Denver Research Inst., Colo.
A STUDY OF THE KINETICS OF TRANSFORMATION OF NIOBIUM-BASE, ZIRCONIUM ALLOYS. Monthly letter no. 13, 1 May 61-1 June 61, on Contract AT(11-1)-752, Suppl. 4. 7p.

HW-68835 $0.50

Hanford Atomic Products Operation, Richland, Wash.
ANNEALING WARM-EXTRUDED ZIRCALOY-2 TO AN ULTRAFINE GRAIN SIZE, by R. L. Knecht. Rept. on Contract AT(45-1)-1350. Mar 61, 12p.

HW-68789 $0.50

Hanford Atomic Products Operation, Richland, Wash.
A FLUX-FREE METHOD FOR JOINING ALUMINUM TO STAINLESS STEEL, by L. C. Lemon. Rept. on Contract AT(45-1)-1350. Mar 61, 11p.

PB 156 957 $3.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
ELECTROPLATING ON MAGNESIUM AND BERYLLIUM. AN ANNOTATED BIBLIOGRAPHY, by Robert C. Gex. Feb 61. 39p. 109 refs. Special bibliography SB-61-4; AD-253 402.

DESCRIPTORS: *Beryllium, Beryllium alloys, *Magnesium, Magnesium alloys, *Electroplating, *Bibliography, Metal coatings, Surfaces, Preparation, Surface properties, Coatings, Processing.

Literature on electroplating on magnesium and beryllium and their alloys is presented. Pretreatment of surfaces for electroplating and testing of electroplated surfaces is included. The following sources were examined: Chemical Abstracts since 1930; Engineering Index since 1930; Review of Metal Literature since 1944; Nuclear Science Abstracts since 1946; Metallurgical Abstracts since 1951; P. A. L. Uniterm index; LMSD TIC Catalogs; and ASTIA Collection. (Author)

NLCO-827 $1.75

National Lead Co. of Ohio, Cincinnati.
ELECTROLYSIS OF $MgF_2$, by W. E. Shaw. Rept. on Contract AT(30-1)-1156. 6 Jan 61, 69p.

PB 156 733 $5.60

Pennsylvania State [U.] Mineral Industries Experiment Station [University Park].
INFLUENCE OF CARBON AND NITROGEN ON TRANSITION TEMPERATURE FOR SAE 3140 STEEL, by Lars Troberg, R. E. Caffrey and others. Final rept. on Research and Development of Relationship Between Certain Metallurgical Variables and Transition Temperatures of Commercial Steels, Contract DA 36-061-ORD-117. 30 Nov 52. 57p. 9 refs. WAL Rept. no. 310/154-12; AD-6822.

This report released for sale to the public 20 July 61.

DESCRIPTORS: *Steel, Transition temperature, Mechanical properties, Carbon, Nitrogen, Metallurgy.

An investigation was made to determine the influence of C and N on the transition temperature of SAE 3140 steel. This steel, in the form of V-notched 0.050-in.-diam wire specimens, was given different wet-hydrogen treatments, including no treatment and then quenched and tempered at 650°C for 1 hr. A water quench from this treatment produced the nonembrittled condition, and cooling at 9°C/hr to 350°C followed by slow cooling to room temperature produced the embrittled condition. Tensile tests were made from room temperature to -196°C. Reduction of area at fracture was plotted against testing temperature to give the transition curves Wet-hydrogen treatment failed to reduce materially the N content, although the amount of C was lowered to 0.02 - 0.03%. Transition-temperature difference seemed to be eliminated in only 1 set of samples, those wet-hydrogen treated for 96 hr at 700°C. The ferritic grain size and the C and N contents of these specimens were not markedly different from those of other specimens.

DP-551 $1.00

Savannah River Lab., Aiken, S. C.
X-RAY DIFFRACTION STUDIES ON ZIRCONIUM AND ZIRCALOY-2, by M. S. Feldman. A literature search. Rept. on Contract AT(07-2)-1. May 61, 44p.

## Structural Metallurgy and Corrosion

HW-66425 $1.00

Hanford Atomic Products Operation, Richland, Wash.
SOME EFFECTS OF NEUTRON RADIATION ON THE MECHANICAL PROPERTIES AND STRUCTURAL CHARACTERISTICS OF HIGH-PURITY IRON, by A. L. Bement. Rept. on Contract AT(45-1)-1350. 1 Sept. 60, 45p.

HW-65962 $2.60

Hanford Atomic Products Operation, Richland, Wash.
A STUDY OF THE WEAR AND GALLING OF AUTOCLAVED ZIRCALOY-2 BY VARIOUS MATERIALS, by J. W. Weber. Interim rept. no. 3. 5 July 60, 30p.

AD-257 866 repriced $1.25

Illinois U., Urbana.
INELASTIC DESIGN OF LOAD CARRYING MEMBERS. PART II. THE EFFECT OF END CONDITIONS ON THE COLLAPSE LOAD OF COLUMNS, by G. A. Costello, O. M. Sidebottom, and Eugene Pocs. Rept. for 1 Nov 59-31 Oct 60 on Metallic Materials, Contract AF 33(616)5658. Jan 61, 48p. 14 refs. WADD Technical rept. 60-580, pt. 2.

DESCRIPTORS: *Elasticity, Deformation, Temperature, *Plasticity, Beams, Stainless steel, Structures, Experimental data, *Fatigue (Mechanics).

A theory was presented for constructing the load-deflection relation and for determining the collapse load of a column having any known end condition. A trial and error solution was required which used interaction curves and assumed that the inelastic column assumed the shape of a sine curve. For time independent inelastic deformation, constant depth of yielding interaction curves were used. For time dependent (creep) inelastic deformation are hyperbolic sine interaction curves were used. The experimental part of the investigation included tests of rectangular section columns made of 17-7PH stainless steel and tested at room temperature and at 972°F. Several slenderness ratios were considered, and the columns had end conditions which were either fixed, equal and opposite end eccentricities, or unequal end eccentricities. Good agreement was found between theory and experiment. (Author)

PB 157 058 $2.60

Institute of Research, Lehigh U., Bethlehem, Pa.
PLASTIC DEFORMATION AND FRACTURE OF METALS AT HIGH RATES OF STRAIN, by C. W. Curtis. Annual rept. 28 Aug 52-27 Aug 53, on Contract DA 36-034-ORD-969. Sep 53, 24p. 19 refs. AD-17 507.

This report released for sale to the public 4 Aug 61

DESCRIPTORS: *Metals, Deformation, Fracture (Mechanics), Stresses, Mathematical analysis, Elasticity, Plasticity.

A study was made of electric strain pulses produced in a cylindrical metal bar by collision with a second bar and by the reflection of an air shock from one end of the bar. Shape, size, and contact time of the bars were considered. Additional evidence is given that the assumptions of Sears (Trans. Cambridge Phil. Soc. 22:49, 1908) provide a reasonably exact basis for analyzing the collision of elastic bars at relatively low velocities. Young's modulus and Poisson's ratio were calculated from longitudinal and radial strain measurements. Characteristics of the longitudinal strain pulse produced by air shock are given, as well as the theory of elastic waves in semi-infinite and infinitely long cylindrical bars. Tests are being made to determine the reliability of the records of plastic waves.

ORNL-CF-60-4-111 $1.10

Oak Ridge National Lab., Tenn.
A GALVANIC CORROSION PROBLEM ASSOCIATED WITH THE PREPARATION OF MULTIMETALLIC BERYLLIUM SAMPLES, by D. M. Hewette, II. 20 Apr 60, 10p.

PB 157 150 $2.60

Ohio State U. Research Foundation, Columbus.
PROTECTION OF NIOBIUM AGAINST OXIDATION AT ELEVATED TEMPERATURES, by J. W. Spretnak and Rudolph Speiser. Annual rept. (Final) 16 July 56-15 July 57, on Protection of Molybdenum against Corrosion at High Temperature, Contract N6onr-225(28). 15 June 57, 28p. 16 refs. Rept. no. 467-15; AD-139 336.

This report released for sale to the public 2 Aug 61.

DESCRIPTORS: *Corrosion, *Niobium, Oxidation, Countermeasures, *Antioxidants, Temperature, Niobates, Calcium compounds, Thorium compounds, Manganese compounds, Sodium compounds, Magnesium compounds, Alloys.

Preparation is reported of Ca niobate, Th niobate, Mn niobate, Na meta-niobate, and 7:6 Na meta-niobate and Mg niobate. Pure Nb sheet was oxidized in still air to provide a basis of comparison with the oxidation behavior of binary and ternary alloys. Binary alloys in the Nb-Zr system were prepared and oxidized. Alloys containing 90 wt-% Nb and 80 wt-% Nb were less resistant to oxidation than pure Nb. An alloy of 70 wt-% Nb and 30 wt-% Zr had slightly better oxidation resistance than pure Nb at 860°C. X-ray analysis of the oxide formed on this alloy indicated the presence of $ZrO_2$ and $6ZrO_2{\cdot}Nb_2O_5$. Oxidation resistance of binary alloys in the Nb-Ti system was greater than pure Nb at 860°C. X-ray analysis indicated that the phases $TiO_2$ and $TiO_2{\cdot}Nb_2O_5$ were present in oxide films formed on the surfaces of alloys containing 73, 64, and 50 wt-% Nb. Ternary alloys in the Nb-Mo-Si system were prepared and oxidized at 860°C. Two alloys containing 48 at. -% Nb, 43 at. -% Si, and 90 at. -% Mo; and 51 at. -% Nb, 32 at. -% Si and 17 at. -% Nb were oxidized. The oxidation rate was much lower than that for pure Nb, but the oxide films formed were not protective. After a small initial weight gain, the samples underwent a rapid loss in weight because of the formation and volatilization of $MoO_3$.

PB 155 284 $3.60

University Coll. of South Wales and Mon. (Gt. Brit.)
IRON-CHROMIUM-NITROGEN ALLOYS, by R. Rawlings and T. B. Koshal. Annual technical rept. no. 1 on Contract DA 91-591-EUC-1392. 31 Jan 61, 35p. 25 refs. AD-253 085.

DESCRIPTORS: *Iron alloys, Chromium alloys, Nitrogen, Nitrides, *Steel, Heat treatment, Shear stresses, Wire, Determination, Measurement, Microstructure, Chromium compounds, Magnetostriction, Stainless steel, Internal friction.

Three half pound ingots, containing 0.94, 4.2, and 10.0% Cr, respectively, were melted and cast under vacuum. The ingots were rolled and drawn to 0.027-in.-wire diam. After decarburising and denitriding in H, the effects of quenching temperature and testing temperature on the shear modulus were determined by means of a torsional pendulum vibrating at about 1 c. The internal friction and critical strain (the minimum strain at which the internal friction is dependent on the maximum strain of vibration) were determined with the same apparatus by measuring the rate of decay of the vibrations. In the range 20 to 100 C the critical strain is practically independent of temperature and of Cr content. Other samples of wire were loaded with N, and the internal friction/temperature curve measured. The curves contained 3 or 4 maxima which all increased with time of heating at 800 to 850 C. (Author)

## NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

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CALCULATING ENERGY RELEASED BY FISSION PRODUCTS, by K. Shure and D. J. Dudziak. Rept. on Contract AT-11-1-GEN-14. Mar 61, 14p.

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COMPARISON OF MEASURED AND CALCULATED THERMAL NEUTRON DISTRIBUTIONS IN HIGH TEMPERATURE WATER SHIELDING, by D. C. Anderson, L. O. Herwig, and W. F. Vogelsang. Rept. on Contract AT-11-1-GEN-14. Mar 60, 12p.

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Bettis Atomic Power Lab., Pittsburgh, Pa.
EXPERIMENTAL AND CALCULATED ACTIVATIONS IN A ONE-DIMENSIONAL SLAB CORE WITH ZIRCONIUM-$H_2O$ REFLECTOR, by J. Korsmeyer, C. Bolmgren, and S. Milani. Rept. on Contract AT-11-1-GEN-14. Jan 61, 35p.

WAPD-T-1308 $2.60

Bettis Atomic Power Lab., Pittsburgh, Pa.
TECHNIQUE FOR ANALYZING PARTIAL WATER WEIGHT EXPERIMENTS, by Q. B. Doub and J. E. Mott. Rept. on Contract AT-11-1-GEN-14. Jan 61, 25p.

BNL-663 $0.50

Brookhaven National Lab., Upton, N. Y.
REPROCESSING OF REACTOR FUELS BY VOLATILIZATION THROUGH THE USE OF INERT FLUIDIZED BEDS, by J. J. Reilly, W. H. Regan and others. Status rept. May 61, 17p.

SRO-51 $3.60

Georgia Inst. of Tech., Engineering Experiment Station, Atlanta.
RADIATION-INDUCED CYANOGENATION OF ORGANIC COMPOUNDS, by J. A. Knight, Jr. and C. J. Bryan. Annual technical status rept. no. 1 on Contract AT(38-1)-202, Task 8. 20 Apr 61, 35p.

HW-67094 $1.50

Hanford Atomic Products Operation, Richland, Wash.
LATTICE PARAMETER MEASUREMENTS FOR A CONCENTRIC TUBE FUEL ELEMENT, by D. E. Wood, K. R. Birney, and E. Z. Block. Rept. on Contract AT(45-1)-1350. 1 Dec 60, 59p.

PB 156 088 $12.00

Laboratory for Nuclear Science, Mass. Inst. of Tech., Cambridge.
PROGRESS REPORT. Rept. no. 54, 1 Feb-30 Apr 59 on Contracts [Nonr-1841(16)] and NASw-37, and National Science Foundation Grant G4532.

DESCRIPTORS: *Nuclear physics, Radiochemistry, Fission, Cosmic rays, Accelerators, Linear accelerators, Radioactivity, Cyclotrons, Generators.

Contents:
Chemistry of the fission elements group
Nuclear chemistry (inorganic) group
Nuclear chemistry (organic) group
Cosmic ray group
High energy accelerator physics group
Bubble chamber group
Linear accelerator group
Rockefeller generator group
ONR generator group
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Cyclotron group
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(See also PB 156 087)

UCRL-9598 $2.00

Lawrence Radiation Lab., U. of California, Livermore.
CONTROLLED THERMONUCLEAR RESEARCH. Quarterly rept. Dec 60-Feb 61 on Contract W-7405-eng-48. 15 Mar 61, 98p.

UCRL-9648 $1.25

Lawrence Radiation Lab., U. of California, Berkeley.
THE MAGNETIC PROPERTIES OF DEFORMED NUCLEI, by L. Chiao. Rept. on Contract W-7405-eng-48. Apr 61, 53p.

TID-11746 $1.00

Office of Technical Information, Atomic Energy Commission, Washington, D. C.
VISIT OF U. S. CONTROLLED THERMONUCLEAR RESEARCH TEAM TO USSR, JULY 1960, by P. R. Bell, A. E. Ruark, and C. M. Van Atta. May 61, 73p.

TID-6597(Rev.) $1.50

Office of Technical Information, Atomic Energy Commission, Washington, D. C.
VISIT OF U. S. HIGH-ENERGY PHYSICS TEAM TO USSR, MAY 1960, by G. A. Kolstad and E. J. Lofgren. 56p.

NYO-9107 $1.10

Radiation Applications Inc., Long Island City, N. Y.
A STUDY OF THE MECHANISM OF RADIATION INDUCED GELATION IN MONOMER-POLYMER MIXTURES. Quarterly summary rept. 1 Feb 61-30 Apr 61, on Contract AT(30-1)-2554. 7p.

## Instruments and Installations

ANL-6367 $0.50

Argonne National Lab., Ill.
RADIOLOGICAL SURVEY OF THE HEALTH DIVISION DIAGNOSTIC X-RAY FACILITY, by A. G. Januska and W. H. Smith. Rept. on Contract W-31-109-eng-38. May 61, 17p.

PB 171 906 $0.75

Naval Radiological Defense Lab., San Francisco, Calif.
A WRIST-CARRIED HIGH RANGE GAMMA-DETECTING RATEMETER, by R. L. Hopton. 15 Dec 60, 23p. 6 refs. Research and development technical rept. USNRDL-TR-488; AD-250 949.

DESCRIPTORS: *Crystal counters, Switches, *Gamma counters, *Radiation counters, Design, Sulfides, Oscillator circuits, Dosimeters, Radiation pyrometers, Cadmium compounds, Crystals.

The blocking oscillator has been combined with a selected cadmium sulfide gamma radiation sensitive crystal to produce a recycling ratemeter which can be carried on the wrist. This instrument features hermetic construction, rechargeable nickel-cadmium battery, range switching (0-5, 50, 500 r/hr), low current drain, and small number of parts. Included in this report is a mathematical analysis of the voltage variable capacitor trigger circuit, and a description of the magnetically actuated range switch mechanism which permits true hermetic operation. Calibration is maintained

within + or - 15 % for all combinations of temperature (-40 to +50 C), humidity (0 - 100 %) and battery condition (1.15 - 1.35v). (Author)

## Nuclear Engineering and Power

AGN TM-390 $1.50

Aerojet-General Nucleonics, San Ramon, Calif.
A PRELIMINARY STUDY OF A 1000 KW (e) MOBILE NUCLEAR POWER SYSTEM. Rept. on Contract AT(10-1)-880. Dec 60, 66p.

PB 155 634 $4.60

Air Force Cambridge Research [Labs.] Bedford, Mass.
THE MEASUREMENT OF FREE AIR ATOMIC BLAST PRESSURES, by Norman A. Haskell and James O. Vann. Rept. on Operation Snapper. Feb 53, declassified 12 Dec 59. 48p. 6 refs. Rept. no. WT-511.

DESCRIPTORS: *Atomic bombs, Blast, Pressure, Measurement, Atmosphere, Instrumentation.

Shock overpressure as a function of time has been measured by utilizing an array of parachute-borne pressure gages spread over a wide range of distances and altitudes above two atomic detonations. The observed peak overpressures, covering the range from about 0.1 to 3.0 psi., confirm existing theory on the effect of altitude on shock overpressure to within practical accuracy requirements, and supplement other free-air peak overpressure measurements made at higher overpressures by other methods.

PB 157 166 $1.60

Air Force Special Weapons Center, Kirtland AFB, N. Mex.
REACTOR FUSING. SOME TECHNICAL POSSIBILITIES, by Thomas G. Stockham, Jr. Aug 60, 16p. 15 refs. AFSWC-TN-60-17; AD-244 053.

This report released for sale to the public 2 Aug 61.

DESCRIPTORS: *Reactor hazards, *Reactor control, *Reactor safety fuzes, Nuclear reactions, Hazards.

The field of reactor fusing is discussed. Fuses are divided into two classes: advanced scram types and atomic scale types. The former are receiving development effort, and the latter offer possibilities for higher reliability. The discussion concentrates upon the atomic scale fuse concept and the study of the dynamics of a particular example. A new approach to the reactor fusing problem is presented, and the technical areas are pointed out which require investigation before further implementation of the concept can be realized. (Author)

ORO-402 $15.50

AMF Atomics, Greenwich, Conn.
HAZARDS SUMMARY REPORT FOR THE UNIVERSITY OF PUERTO RICO NUCLEAR REACTOR. Rept. on Contract AT-(40-1)-2422, 2nd ed. Mar 60, 236p.

ANL-6076 $3.50

Argonne National Lab., Ill.
DESIGN OF THE ARGONNE LOW POWER REACTOR (ALPR), by N. R. Grant, E. E. Hamer and others. Rept. on Contract W-31-109-eng-38. May 61, 269p.

ANL-6365 $0.50

Argonne National Lab., Ill.
FLUX AND TEMPERATURE PEAKING EFFECTS RESULTING FROM THE USE OF SEAMED FUEL TUBES IN CP-5, by D. P. Moon. Rept. on Contract W-31-109-eng-38. May 61, 18p.

ANL-6242 $0.50

Argonne National Lab., Ill.
A GEOMETRY CORRECTION FOR PLANE SOURCE AGE MEASUREMENTS IN HYDROGENOUS MEDIA, by E. F. Bennett and J. Haugsnes. Rept. on Contract W-31-109-eng-38. Apr 61, 21p.

ANL-6083 $0.75

Argonne National Lab., Ill.
METALLURGICAL EVALUATION OF FAILED BORAX-IV REACTOR FUEL ELEMENTS, by C. F. Reinke, L. A. Neimark and others. Rept. on Contract W-31-109-eng-38. May 61, 36p.

ANL-6387 $1.75

Argonne National Lab., Ill.
REACTOR DEVELOPMENT PROGRAM. Progress rept. for June 61 on Contract W-31-109-eng-38. 15 July 61, 69p.

BAW-1220 $2.50

Atomic Energy Div., Babcock and Wilcox Co., Lynchburg, Va.
SPECTRAL SHIFT CONTROL REACTOR BASIC PHYSICS PROGRAM. Quarterly technical rept. no. 3, Jan-Mar 61, on Contract AT(30-1)-2602. 78p.

NAA-SR-6039 $1.25

Atomics International, Canoga Park, Calif.
DESIGN CRITERIA AND EXPERIENCE IN NUCLEAR FUEL IRRADIATIONS, by D. G. Harrington. Rept. on Contract AT(11-1)-GEN-8. 15 July 61, 56p.

NAA-SR-MEMO-5673 $7.60

Atomics International, Canoga Park, Calif.
THERMAL UTILIZATION MEASUREMENTS WITH U-10 MO FUEL IN THE HALLAM EXPONENTIAL LATTICES, by O. R. Hillig. 19 Dec 60, 73p.

WAPD-MRP-92 $2.50

Bettis Atomic Power Lab., Pittsburgh, Pa.
PRESSURIZED WATER REACTOR (PWR) PROJECT. Technical progress rept. 24 Apr 61-23 June 61, on Contract AT-11-1-GEN-14. 131p.

BNL-670 $0.50

Brookhaven National Lab., Upton, N. Y.
EVALUATION OF INTERNAL PRESSURIZATION FOR APPLICATION TO PRESSURIZED WATER REACTOR SYSTEMS, by K. C. Hoffman and J. McNicholas. 26 Apr 61, 11p.

BNL-5483 $1.60

Brookhaven National Lab., Upton, N. Y.
RADIUS CONTROL SYSTEM, by H. J. Halama. 26 Apr 61, 11p.

HW-68044 $1.60

Hanford Atomic Products Operation, Richland, Wash.
MARK V DISSOLVER INFORMATION MANUAL, by H. P. Simonds. Rept. on Contract AT(45-1)-1350. 6 Jan 61, 15p.

UCRL-9671 $0.50

Lawrence Radiation Lab., U. of California, Berkeley.
BEVATRON OPERATION AND DEVELOPMENT. XXVIII, by W. D. Hartsough and W. W. Salsig. Rept. Nov 60-Jan 61, on Contract W-7405-eng-48. 8 May 61, 13p.

UCRL-9500 $2.50

Lawrence Radiation Lab., U. of California, Livermore.
CONTROLLED THERMONUCLEAR RESEARCH. Quarterly rept. Sept-Nov 60, on Contract W-7405-eng-48. 15 Dec 60, 119p.

UCRL-6429-T $1.10

Lawrence Radiation Lab., U. of California, Livermore.
A LOW-BACKGROUND BETA COUNTER FOR USE IN ANTICOINCIDENCE WITH THE AMPEREX COSMIC RAY SHIELD, by J. H. Dellis. Rept. on Contract W-7405-eng-48. 26 Apr 61, 9p.

CF-61-4-83 $1.10

Oak Ridge National Lab., Tenn.
NEUTRON LOSSES TO $Pa^{233}$ IN THE AQUEOUS HOMOGENEOUS BREEDER REACTOR, by J. W. Miller and L. G. Alexander. 26 Apr 61, 7p.

CF-61-4-100 $4.60

Oak Ridge National Lab., Tenn.
A REVIEW OF REACTIVITY LIFETIME ANALYSIS FOR CONTINUOUSLY FUELED, SOLID FUEL REACTORS, by B. E. Prince, 10 Apr 61, 43p.

CF-61-5-62 $1.60

Oak Ridge National Lab., Tenn.
XENON POISONING IN MOLTEN SALT REACTORS, by J. W. Miller. 3 May 61, 18p.

PB 157 224 $4.60

Ohmart Corp., Cincinnati, Ohio.
STUDY AND DEVELOPMENT OF NUCLEAR BATTERIES. Quarterly scientific rept. no. 6 on Contract AF 33(616)172. [1954] 45p. AD-47 919.

This report released for sale to the public 3 Aug 61.

DESCRIPTORS: *Radioactive batteries, *Electrodes, Materials, Voltage, Electrochemistry, Coatings, Electrodeposition, Design, Circuits.

Methods of preparing electrodes are being investigated. Work with noble metal electrodes consisted mainly of the preparation of Cu oxide electrodes through electrodeposition. Results of preparing oxide films through the mechanism of air oxidation indicated that the oxide coating could be improved by etching the electrode base with $HNO_3$. An investigation on the model W battery revealed that the output current can be increased by a factor of over 100. Tests on this battery with the 1-c $Sr^{90}$ source were discontinued as a result of a leakage that developed in the source. In order to investigate the effect of source geometry on output current, the model C battery was built. This battery has the same outside diameter and electrode structure of the model E battery, except that the source is located in a center well. A new type of battery, the model AE was designed as a result of studies of the original model E battery. This battery incorporates several changes which should increase the efficiency. Six of the batteries were built with 3 different electrode pairs. Measurements that were made on cell no. 6 indicated that absorbed gases were being released at elevated temperatures since the cell underwent permanent change in open circuit voltage when subjected to a high temperature. In order to eliminate this, the vacuum system is being rebuilt. Another new type of battery, the model RE, was designed. This battery incorporates most of the innovations of the model AE. In addition, the source is mounted inside the battery so that absorption in the window is eliminated. (See also PB 157 223)

PB 157 225 $4.60

Ohmart Corp., Cincinnati, Ohio.
STUDY AND DEVELOPMENT OF NUCLEAR BATTERIES. Quarterly scientific rept. no. 7 on Contract AF 33(616)172. [1954] 49p. 3 refs. AD-48 095.

This report released for sale to the public 3 Aug 61.

DESCRIPTORS: *Radioactive batteries, *Electrodes, Materials, Electrochemistry, Voltage, Design, Copper compounds, Oxides, Circuits, Magnesium, Sodium, Lithium.

Electrodes of Mg, Na, and Li were investigated. Mg and Na electrodes resulted in open-circuit voltages of 1.6 v and 2.25 v, respectively, when measured against Au; Li electrodes resulted in open-circuit voltages against C as high as 3.27 v. Work with electronegative electrodes was confined to an investigation of methods of preparation of Cu oxide electrodes. Results indicate that the electrodeposition of this material was not a success as no voltage improvement was obtained. Some work was accomplished with electrodes of pure and mixed salts but the data were inconclusive since the measurements were made with air as the filling gas and the open-circuit voltage was apparently a function of the humidity.

Model W batteries were rebuilt with thin Al foil electrodes. Preliminary tests were run which indicated that the current was lower by a factor of approximately 50 than was originally anticipated, probably owing to the fact that the electrode spacing was not altered in the new construction. Tests showed that the new mechanical design of the model RE battery is sufficiently rugged. Difficulties were encountered in attaching the insulating electrode to the Kovar seals without fracturing the seals. Only 2 cells were tested for temperature coefficient. Results indicated that the temperature coefficient to a large extent, was the result of change of ion utilization efficiency with temperature. By applying an external voltage large enough to give approximately 100% ion utilization efficiency, it was possible to reduce the temperature coefficient to a negligible value. (See also PB 157 224)

PB 157 226 $5.60

Ohmart Corp., Cincinnati, Ohio.
STUDY AND DEVELOPMENT OF NUCLEAR BATTERIES. Quarterly scientific rept. no. 8 on Contract AF 33(616)172. [1954] 58p. AD-51 362.

This report released for sale to the public 3 Aug 61.

DESCRIPTORS: *Radioactive batteries, *Electrodes, Materials, Design, Electrodeposition, Potassium, Alkali metals, Seals, Circuits, Voltage.

Some work has been done on the preparation of potassium electrodes. Results were disappointing in that the open circuit voltage fell off very rapidly with time and the original open circuit voltage was considerably lower than that obtained with a carbon-lithium battery. An apparatus for casting alkali metal disks in an inert atmosphere has been designed and is being fabricated. A number of CuO/Cu disk electrodes have been produced by electrodeposition with equipment which was refined to make it possible to wash the electrodes in distilled water after deposition. Results of measurements of these electrodes showed them to lack reproducibility. The use of a new electrode crimping fixture has eliminated the strain previously developed on kovar seals in the assembly of Model "RE" batteries, and a new type sealing gasket has apparently eliminated any leakage problems. (See also PB 157 225)

IDO-16635 $1.00

Phillips Petroleum Co., Idaho Falls.
THE DEPENDENCE OF REACTOR BEHAVIOR ON THE SELF-SHUTDOWN MODE, by S. G. Forbes. Rept. on Contract AT(10-1)-205. 25 Apr 61, 42p.

IDO-16653 $0.75

Phillips Petroleum Co., Idaho Falls.
ETR GAMMA HEAT GENERATION MEASUREMENTS FOR CYCLES 27, 33, AND 34, by L. D. Weber and C. H. Hogg. Rept. on Contract AT(10-1)-205.. 31 May 61, 34p.

IDO-16623 $1.75

Phillips Petroleum Co., Idaho Falls.
HAZARDS EVALUATION OF PROPOSED SITE FOR ETR II, by D. R. deBoisblanc, R. J. Nertney, and L. H. Jones. Rept on Contract AT(10-1)-205. 18 Aug 60, 81p.

IDO-16693 $0.75

Phillips Petroleum Co., Idaho Falls.
SPERT PROJECT, ed. by F. Schroeder. Quarterly technical rept. Jan-Mar 61, on Contract AT(10-1)-205. 30 June 61, 30p.

TID-13076 $3.60

Stanford U., Calif.
TRANSIENT BEAM LOADING CALCULATIONS FOR LINEAR ELECTRON ACCELERATORS. PART I: UNIFORM STRUCTURES; PHASE MODULATION, by R. H. Helm. May 61, 35p. M rept. no. 266.

YAEC-139 $6.60

Westinghouse Electric Corp., Pittsburgh, Pa.
THERMAL DEFLECTION OF THE YANKEE FIRST CORE FUEL ASSEMBLY, by H. Chelemer. Rept. on Contract AT(30-3)-222. Jan 61, 67p.

## Nuclear Reactions

NYO-2854 $3.60

Rochester U., N. Y.
APPLICATION OF DISPERSION RELATIONS TO THE PHOTODISINTEGRATION OF THE DEUTERON, by B. Sakita and C. J. Goebel. Rept. on Contract AT(30-1)-875, 10 Apr 61, 36p.

NYO-9686 $5.60

Rochester U., N. Y.
THE PROTON-PROTON TRIPLE SCATTERING PARAMETERS R AND A AT 213 MEV, by A. C. England W. A. Gibson and others. Rept. on Contract AT(30-1)-875. 17 Apr 61, 56p.

K-1478 $1.00

Union Carbide Nuclear Co., Oak Ridge, Tenn.
EXTENSIONS OF NEUTRON INTERACTION CRITERIA, by H. F. Henry, C. E. Newlon, and J. R. Knight. Rept. on Contract W-7405-eng-26. 11 July 61, 43p.

## Radioactivity

ANL-6347 $0.50

Argonne National Lab., Ill.
THE PERFORMANCE OF A MOTOR, A SWITCH, AND TWO TYPES OF PRESSURE PICKUP IN A HIGH-GAMMA-FLUX ENVIRONMENT, by J. E. Ayer and G. J. Pokorny. Rept. on Contract W-31-109-eng-38. June 61, 17p.

UCRL-9382 $0.80

Lawrence Radiation Lab., U. of California, Berkeley.
DECAY SCHEME OF $E^{253}$, by F. Asaro, S. G. Thompson and others. Rept. on Contract W-7405 eng-48. Sep 60, 7p.

## Waste Disposal

HW-69256 $1.10

Hanford Atomic Products Operation, Richland, Wash.
THE EFFECT OF GAMMA RADIATION ON CLINOPTILOLITE, by R. Fullerton. Rept. on Contract AT(45-1)-1350. 25 Apr 61, 7p.

IDO-14548 $0.50

Phillips Petroleum Co., Idaho Falls.
PNEUMATIC ATOMIZING NOZZLES IN FLUIDIZED BED CALCINING. I. CALIBRATION TESTS, by B. M. Legler and J. I. Stevens. Rept. on Contract AT(10-1)-205. 12 May 61, 29p.

IDO-14504 $2.50

Phillips Petroleum Co., Idaho Falls.
RESEARCH AND DEVELOPMENT STUDIES ON WASTE STORAGE PROCESS, by M. H. Ortner, C. J. Anderson, and P. F. Campbell. Rept. on Contract AT(10-1)-205. 19 May 61, 131p.

# PERSONNEL SUPPLIES AND PERSONAL EQUIPMENT

PB 157 148 $7.60

Engineering Div., Air Materiel Command, Wright-Patterson AFB, Ohio.
MODEL PARACHUTES, COMPARISON TESTS OF VARIOUS TYPES, by Theodor Knacke and Alfons Hegele. 12 Jan 49, 76p. 10 refs. Memo. rept. no. MCREXE-672-12B; ATI-67 374.

This report released for sale to the public 3 Aug 61.

DESCRIPTORS: *Parachutes, Tests.

Parachutes of the following types were tested: solid flat parachutes - round, square, and triangular; solid conical parachutes with various cone angles - round, square and triangular; solid half-and-quarter spherical parachutes - round, square, and triangular; solid flat parachutes with clipped corners - square and triangular; airfoil parachute with 50% vent; guide surface parachutes; pseudo-ribbon parachutes, flat, with various porosities - round; and three types of ribbon parachutes - FIST, WAKO, and a triangular type.

# PHYSICS

UCRL-5792-T $1.60

Lawrence Radiation Lab., U. of California, Livermore.
EFFECT OF CHOICE OF ELECTRICAL CONDUCTOR ON POWER REQUIREMENTS OF LOW TEMPERATURE MAGNETS, by R. G. Mallon. 13 Nov 59, 17p.

PB 157 178 $7.60

Oklahoma U. Research Inst., Norman.
IONIZED GAS FLOW IN ELECTRICALLY ENERGIZED SHOCK TUBES, by William R. Atkinson and William R. Holden. Technical rept. on Contract Nonr-982(02). 15 Aug 54, 72p. 23 refs. AD-48 093.

This report released for sale to the public 4 Aug 61.

DESCRIPTORS: *Shock tubes, *Gas flow, Gas ionization, Transients, Spectrographic analysis, Plasma physics.

Instantaneous luminosity distribution in an electrically energized shock tube was investigated spectrographically and kinematically with a Kerr-cell shutter and a rotating mirror. In this tube an approximate 1 j/cc discontinuity in the energy distribution throughout a cylindrical volume of gas is produced by discharging a capacitor through the portion of the gas located between 2 electrodes. Subsequently, many properties of the gas undergo a progressive change which is propagated through the tube with a definite velocity. To a large extent the observed phenomena may be correlated with the theory and behavior of the diaphragm shock tube filled with an ideal gas. A new method of generating shock waves in conducting gasses was demonstrated by placing a portion of a long metallic tube in a magnetic field of $10^4$ oersteds directed perpendicularly to the tube. Highly ionized gas was made to flow through this tube with a velocity greater than 10 km/sec. A shock developed at the point where the flow entered the strong magnetic field. This shock was used to probe the flow, and the measurement of its velocity permitted upper and lower temperature bounds to be established for portions of the flow.

HW-SA-2146 $8.60

Washington State Coll, Pullman
THE MEASUREMENT OF THE ELECTRON ENERGY REQUIRED TO PRODUCE AN ION PAIR IN VARIOUS GASES, by Ira Thomas Myers. Doctoral thesis 1958, 96p.

## Electronics

BNL-5482 $2.60

Brookhaven National Lab., Upton, N. Y.
THE SIGNAL-FLOW DIAGRAM FOR THE AGS RADIO-FREQUENCY SYSTEM, by H. Hahn. 28 Apr 61, 8p.

PB 155 651 $9.10

Case Inst. of Tech., Cleveland, Ohio.
ANALYSIS OF THE INTERACTION BETWEEN A MEASURING PROBE AND A REFLECTOR, by Hwei-piao Hsu. Scientific rept. no. 22 on Contract AF 19(604)3877. 28 Feb 61, 105p. 31 refs. AFCRL-78; AD-254 415.

DESCRIPTORS: *Electric fields, Reflection, Measurement, *Antennas, *Diffraction, Differential equations, Scattering, Analysis, Reflectors.

The effect of the interaction between the reflector edge, and/or the reflector, and the probe antenna on the measuring signal was investigated. The analysis was based on the reciprocity theorem for two antennas, with the use of the solutions mentioned in the following. The diffraction of a dipole field by a conducting half plane in a parallel plate region was studied by the method based on the Wiener-Hopf technique. A solution to the above problem that is suitable for the present purpose was obtained. The induced current on the surface of a prolate spheroid due to a uniform applied field was investigated, the purpose being to obtain an estimate of the current distribution on a probe antenna. The problem of a prolate spheroid was treated as an approximation to a cylindrical probe. A technique to estimate the relative error between the observed signal and the actual field in the absence of the probe, as a function of the probe parameter, was developed and some numerical examples evaluated. (Author)

PB 157 138 $2.60

Cruft Lab., Harvard U., Cambridge, Mass.
REFLECTION AND REFRACTION OF A PLANE ELECTROMAGNETIC WAVE AT A PERIODICAL SURFACE, by C. T. Tai. Technical rept. no. 28 on Contract N5ori-76, T.O. 1. 15 Jan 48, 26p. 7 refs. ATI-50 892.

This report released for sale to the public 1 Aug 61.

DESCRIPTORS: *Electromagnetic waves, *Electromagnetic wave reflections, Reflection, Refraction, Wave transmission, Propagation, Surfaces.

The object of this investigation is to study the propagation of a plane electromagnetic wave across a periodical surface. The medium underneath the surface is assumed to be arbitrary in the general formulation. The problem is much simplified when the surface is perfectly conducting. The reflected waves from the surface, then, consist of an infinite set of plane waves, of which all modes higher than a certain definite order are evanescent. This criterion bears a direct relation to that of simple grating theory. Amplitudes of a few of the low-order modes have been calculated assuming the mechanical wavelength of the surface to be much smaller than the electromagnetic wavelength. (Author)

PB 157 222 $6.60

Electronics Research Labs., Columbia U., New York.
THE EFFICIENCY OF SPARK DISCHARGES AS A SOURCE OF SHOCK AND ACOUSTIC WAVES, by I. Horiuchi. Technical rept. T-1/148 on Contract AF 30(602)1897. 14 Aug 59, 67p. 24 refs. CU-1-59-AF-1897-ERL; RADC-TN-59-287; AD-232 813.

This report released for sale to the public 7 Aug 61.

DESCRIPTORS: *Sparks, Gas discharges, *Shock waves Propagation, Shock tubes, Theory, *Sound.

Three problems related to the production of shock waves and acoustic waves by a spark source are analyzed (the discharge of capacitor-stored energy across a narrow gap is assumed to instantaneously ionize a small volume of gas in the region of the gap). The following factors are considered: (1) the efficiency of spark sources as generators of compressional waves (shock and acoustic) in air as a function of ambient pressure; (2) the magnitude of the ensuing shock wave as a function of the input electrical energy, the electromechanical conversion efficiency of this process, and the velocity of the resulting shock wave (it is shown that the resulting shock strength, is independent of the ambient pressure); and (3) the efficiency of a spark source in producing sound waves (the efficiency increases directly with ambient pressure). (Author)

## Molecular Physics and Spectroscopy

PB 155 732 $1.60

Electrical Engineering Research Lab., U. of Texas, Austin.
CALCULATED VALUES OF ABSORPTION DUE TO WATER VAPOR AND OXYGEN IN THE MILLIMETER SPECTRUM, by C. W. Tolbert and R. M. Dickinson. Rept. on Contract AF 19(604)8038. 20 Feb 61, 14p. 4 refs. Rept. no. 6-42; AFCRL-TN-61-63; AD-254 460.

DESCRIPTORS: *Water vapor, *Absorption, Attenuation, Atmosphere, Spectrographic analysis, *Oxygen, *Infrared radiation, Experimental data, Statistical analysis, Electromagnetic waves.

Graphs of the calculated values of water vapor absorption at sea level, 2, 4, 6, and 8 kms elevation and the total water vapor attenuation through the lower 9 kms of the earth's atmosphere for elevation angles of 90, 60, 30, and 15 degrees in the frequency range of 10 to 400 kmc are presented. The attenuation due to the combined oxygen absorption lines at sea level over the same frequency range and calculated values of oxygen absorption at sea level, 8, 11, and 32 kms in the frequency range of 50 to 70 kmc by T. F. Rogers are also included. The basis of the calculations is a best fit of the measured values of water vapor attenuation at sea level. The attenuation was extrapolated to high elevations for a standard NACA atmosphere with the pressure and temperature dependence explicit in the Van Vleck-Weisskopf equation. (Author)

PB 155 856 $2.60

Institute of Mathematical Sciences, New York U., N. Y.
BOUNDS ON SCATTERING PHASE SHIFTS FOR COMPOUND SYSTEMS, by Leonard Rosenberg and Larry Spruch. Rept. on Contracts AF 19(604)4555, DA 30-069-ORD-2581, and Nonr-285(49). Oct 60, 26p. 17 refs. Research rept. no. CX-52; AFCRL-TN-60-687; AD-254 789.

DESCRIPTORS: *Scattering, *Particles, Electrons, Functions, Inequalities, Integral equations.

An extension of recently developed methods determines a rigorous upper bound on 1/ (-k cot eta), where eta is the phase shift, for the general one channel scattering process. The method requires truncation of the various potentials, but it should generally be possible. In practice, to so truncate the potentials that the difference between the phase shifts of the original problem and of the problem for which a bound is obtained is insignificant. It is necessary to introduce, for compound system scattering, an absolute definition of the phase shift, not simply a definition modulo pi. The

definition chosen is to take the projection of the full scattering wave function on the ground state wave function of the scattering system, and to treat the resultant one coordinate wave functions as if it were the scattering wave function for a particle on a center of force. Though irrelevant with regard to the determination of a bound on cot eta, it is interesting that at least for some simple cases this definition automatically increases the phase shift by at least pi whenever the Pauli principle introduces a spatial node into the scattering wave function. The triplet scattering of electrons by H atoms provides an example.

PB 155 819 $4.60

Institute of Mathematical Sciences, New York U., N. Y.
CORRELATION AND QUANTUM CORRECTIONS IN THE THOMAS-FERMI MODEL OF THE ATOM, by Gene A. Baraff. Rept. on Contracts AF 19(604)4555, DA 30-069-ORD-2581, and Nonr-285(49). Feb 61, 46p. 22 refs. Research rept. no. CX-53; AFCRL-TN-61-204; AD-254 912.

DESCRIPTORS: *Atoms, Green's function, Series, Differential equations, *Atomic structure.

An equation is derived which determines the first correction to the Thomas-Fermi potential in terms of the Fermi momentum of the ordinary Thomas-Fermi model and the separation energy of an infinite electron gas. This correction describes the change from the Thomas-Fermi potential due to exchange, inhomogeneity, and correlation effects, and is the first term of a series whose higher members can, in principle, be found using the techniques described. (Author)

PB 155 855 $2.60

Institute of Mathematical Sciences, New York U., N. Y.
THE 7s EXCITED STATE OF THE CESIUM ATOM, by Harvey J. Brudner. Rept. on Contracts AF 19(604)4555, DA 30-069-ORD-2581, and Nonr-285(49). Oct 60, 30p. 19 refs. Research rept. no. CX-51; AFCRL-TN-60-690; AD-254 911.

DESCRIPTORS: *Electrons, *Excitation, *Cesium, *Atoms, Mathematical analysis, Atomic structure, Differential equations, Quantum mechanics, Alkali metals, Theory, Atomic energy levels, Functional analysis, Electron transitions, Atomic orbitals, *Nuclear states, Quantum statistics, Tables, Functions.

A technique has been developed for the calculation of excited state, one-electron wave functions based on the Thomas-Fermi statistical theory of the atom. The technique is applicable to heavy atoms for which Hartree type solutions are complex and difficult to obtain. The previously obtained Thomas-Fermi core potential for the cesium atom and a Heisenberg type polarization correction is used as a central field in the Schrodinger equation. Correction for penetration of the excited electron's orbital is made, and the Biermann-Lubeck approach for solving the wave equation is utilized. This allows for the inclusion of a qualitative correction for exchange. The cesium atom's 7s excited state which has not been obtained by any Hartree method is computed. (Author)

PB 156 856 $11.00

Laboratory of Astrophysics and Physical Meteorology, Johns Hopkins U., Baltimore, Md.
SELF AND FOREIGN GAS BROADENING IN THE PURE ROTATION SPECTRUM OF WATER VAPOR (475 TO 690 WAVE NUMBERS) by Jerald R. Izatt. Progress rept. on Contract Nonr-248(01). 15 Aug 60, 144p. 33 refs. AD-250 441.

DESCRIPTORS: *Molecular rotation, Spectrographic analysis, Water vapor, *Molecular spectroscopy, Absorption, Temperature, Pressure, Spectrographic data, Analysis, *Gases.

Accurate experimental values of the integrated absorption coefficient were measured for a number of lines in the $H_2O$ pure rotation spectrum. These were combined with accurate equivalent width measurements for the same lines to obtain line half-widths which, in the case of self-broadening, display similar accuracy. The criteria of self-consistency and qualitative agreement with well-established theoretical concepts were invoked to test the validity of these results and satisfied. The two simple theses that the line strength is significantly affected by centrifugal stretching and that the line half-widths depend on the rotational state were amply demonstrated. (Author)

UCRL-9642 $0.75

Lawrence Radiation Lab., U. of California, Berkeley.
SOME USEFUL TABLES FOR NUCLEAR SPECTROSCOPY IN TRANS-MERCURY GROUP OF ELEMENTS: ELECTRON BINDING ENERGIES, X-RAY ENERGIES, AUGER ELECTRON ENERGIES AND FLUORESCENT YIELDS, by E. K. Hyde. Rept. on Contract W-7405-eng-48. 1 May 61, 29p.

OTS SB-467 $0.10

Office of Technical Services, Dept. of Commerce, Washington, D. C.
INFRARED, PART II: INFRARED SPECTROSCOPY. May 61, 11p. 188 refs. OTS Selective Bibliography SB-467.

DESCRIPTORS: *Infrared spectroscopy, Bibliography.

Lists 188 PB reports, translations, and AEC reports added to the OTS collection during period 1950 to June 1961. Covers material on infrared spectroscopy, infrared spectrum analysis, and infrared spectrometers. (SB-466 INFRARED Part I lists reports on general research, infrared detectors, infrared photography, infrared optical equipment and materials, and other infrared equipment.)

PB 152 748 $3.60

Research Labs. for the Engineering Sciences, U. of Virginia, Charlottesville.
PRELIMINARY DESIGN OF A MULTI-DISC VELOCITY SELECTOR, by H. J. Davis, Jr. and J. H. Bodine. Sep 60, 40p. 6 refs. Rept. no. AST-4435-107-60U; AD-245 115.

DESCRIPTORS: *Molecular beams, Velocity, Measurement, *Laboratory equipment, Design, Separation, Selection, Mathematical analysis, Molecules.

The straight perpendicular slots of a multi-disc velocity selector offer the attractive advantages of ease of construction and low rotor moment of inertia. The details of a preliminary design of a selector to measure molecular velocities from $7.68 \times 10^5$ to $4.5 \times 10^5$ cm./sec. using a maximum rotational speed of 300 to 500 rps are presented. Resolution comparable to selectors now in use is achieved. A systematic iterative solution is given for the design of the selector configuration. Elimination of molecules with the "wrong" speed, machining practices, structural limitations, ease of alignment of the slots on the discs, and high transmission (portion of time the selector is open to a parallel beam) are considered. The final design consists of seven discs of radius 15 to 23 cm., thickness approximately 3 mm. and an over-all selector length of 21 cm. The slot width and height are 1 mm. and 1 cm., respectively, and the selector has a transmission of approximately 40%. All molecular velocities of experimental importance, except those to be selected, are eliminated by this selector design. (Author)

## Optics

PB 155 805 $19.75

Air Force Cambridge Research Labs., Bedford, Mass
BACKGROUND MEASUREMENTS DURING THE INFRARED MEASURING PROGRAM 1956(IRMP 56), by Max R. Nagel, ed. 322p. 36 refs. GRD Research Notes no. 46; AFCRL-TN-60-692; AD-254 560.

DESCRIPTORS: *Infrared radiation, Measurement, Symposia, Targets, *Infrared research, Atmosphere, Sun, Earth, Sky.

Contents:
Background measuring activities in IRPM 56
The meteorological environment of infrared measuring program 1956
Calibration procedures used at IRMP
Atmospheric optics measurements, Colorado. Sept 17 to 26, 1956
Hemispheric irradiance from sun, atmosphere, and earth as recorded at Peterson Field and Pikes Peak
Measurements of angular and time distributions of spectral irradiance from sun and sky
The spectral radiance of the sky in the Colorado Springs area
The distribution of infrared radiance from the clear sky at Pikes Peak
Maps of sky luminance at various altitudes
Spectral ground and sky backgrounds
Radiation measurements with the P-W Radiometer-Gradient meter
Spectral radiance of terrain in the Pikes Peak area
Ground background radiation as a function as sun angle
Measurements of ground backgrounds at IRMP 1956
Infrared radiance measurements of some terrains near Colorado Springs.

PB 157 062 $26.00

Anderson-Nichols [and Co., Boston, Mass.]
OPTICAL ELEMENTS FOR FIRE CONTROL INSTRUMENTS. Rept. on Contract W36-038-ORD-3476. Nov 45, printed Apr 51. 551p. 89 refs. ATI-170 108.

This report released for sale to the public 1 Aug 61.

DESCRIPTORS: *Fire control, Instrumentation, *Optical instruments, Prisms (Optics), Precision finishing, Lenses, Production, Manufacturing methods, Optical glass.

This manual has been prepared with the twofold purpose of providing a reference book of the various processes and methods that are in current use for the manufacture and inspection of precision optical elements used in fire control and other optical instruments, and of providing a textbook that can be used as a basis for training supervisory and working personnel in the making of such elements. It will be of value to production and industrial engineers who may be responsible for planning the production of precision optical elements, and to operating managers and superintendents who are engaged in their manufacture and who must train operating personnel, either as skilled craftsmen or for specific duties. Since much has been published on the design of optical systems and optical instruments, this manual is not intended for the technical optical engineer but rather for those who may be interested in the actual manufacture of lenses, prisms, and other optical elements.

PB 155 793 $1.60

Washington Square Coll., New York U., N. Y.
A STUDY OF THE FAR INFRARED PROPERTIES OF CRYSTALS, BY J. H. Rohrbaugh. Scientific rept. no. 13, 1 Sep-30 Nov 60, on Far Infrared Project, Contract AF 19(604)2673, continuation of Contracts W 28-099-ac-171, AF 19(122)4 and AF 19(604)1115. [1960] 17p. 1 ref. AFCRL-123; AD-254 514.

DESCRIPTORS: *Crystals, Infrared radiation, Infrared spectroscopy, *Infrared equipment, Diffraction gratings, Mirrors, Frequency, Temperature, Optics.

An analysis is presented of the path of the radiation through the far infrared spectrometer in which the angular range expected for a particular wavelength, and the wavelength range for a small angular region are calculated, and applied to a typical situation. (Author) (See also PB 171 274)

## Solid State Physics

ANL-6280 $0.50

Argonne National Lab., Ill.
AN ULTRASONIC MEASUREMENT SYSTEM FOR THE PRECISE DETERMINATION OF THE ELASTIC MODULI OF SINGLE CRYSTALS, by C. J. Renken. Rept. on Contract W-31-109-eng-38. May 61, 17p.

PB 171 897 $0.50

Army Signal Research and Development Lab., Fort Monmouth, N. J.
A CATALOG OF THE PROPERTIES OF FERROMAGNETIC MATERIALS AT MICROWAVE FREQUENCIES, by Irving Reingold and John L. Carter. Jan 61, 15p. 3 refs. USASRDL Technical rept. 2179; AD-251 316.

DESCRIPTORS: *Ferromagnetic materials, Dielectric properties, *Electromagnetic properties, Magnesium compounds, Manganese compounds, Ferrites, Oxides,

Nickel compounds, Aluminates, Copper, Cobalt, *Catalogs, Microwave frequency.

The microwave properties of a large number of ferromagnetic materials have been determined and catalogued. The measurements were made primarily in the 9000-mc frequency region at low incident power level. The real and imaginary portion of the dielectric constant, saturation magnetization, loss tangent, and figure of merit are listed. (Author)

AD-256 574 $1.60

Carnegie Inst. of Tech., Pittsburgh, Pa.
SOME RESULTS CONCERNING TWO DIMENSIONAL FACETING, by W. W. Mullins and R. F. Sekerka. Research rept. no. 2 on Contract [DA 36-034-ORD-2794] 13 June 60, 20p. 3 refs. OOR 2320:3.

DESCRIPTORS: Crystals, *Crystal structure, Surfaces, Energy, Surface properties, Convex sets, *Tensor analysis, *Scheduling.

Herring (Phys. Rev. 82:87, 1951) has given a detailed discussion in terms of the Wulff plot of the conditions under which an initially plane surface will break up into a hill and valley structure (faceting). Some of his conclusions are elaborated and extended for the special case of two dimensional faceting in which the surfaces become lines or curves in a plane. Examples in which this case is of practical importance are (1) a surface breaking up into facets that are all parallel to a given direction so that the typography is completely specified by a section transverse to this direction; (2) a step height or ledge created on a surface by an adsorbed layer or a lamella and regulated in its form by an orientation dependent ledge energy. (Author)

PB 154 101 $3.60

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge.
EFFECT OF MONO- AND TRIVALENT CATIONS ON COLOR CENTERS IN CALCIUM FLUORIDE, by William J. Scouler. Doctoral thesis. Rept. on Contract Nonr-1841(50). Apr 60, 31p. 21 refs. Technical rept. 147; AD-235 390.

DESCRIPTORS: *Crystals, *Calcium compounds, Fluorides, Colors, Ions, Sodium compounds, Yttrium compounds, X-rays, Electrons, Additives.

Coloration of pure $CaF_2$ crystals with 2.5-Mev electrons at room temperature gives four bands located at 580, 400, 335, and 225 mμ. Low-temperature (-190°C) coloration, however, yields different bands, located at 545, 320, and 275 mμ. In $YF_3$-doped crystals. They are, however, enhanced, and at room temperature their intensity ratios are significantly changed, the 400-mμ band being predominant. NaF-doped crystals show an even more drastic change. Coloration at room temperature produces bands at 605, 385, and 330 mμ, while coloration at -190°C yields bands at 440, 390, 315, and 200 mμ. The coloration in NaF-doped crystals is deeper than in either pure or $YF_3$-doped crystals. Several explanations for the modification of the color-center spectra by doping are possible: in $YF_3$-doped crystals, interstitial $F^-$ ions may act as a source of electrons and holes and/or induce vacancy formation through lattice distortion; and in NaF-doped crystals, $F^-$ vacancies may act as traps and/or enhance oxygen contamination by diffusion. (Author)

PB 156 086 $6.60

Laboratory of Chemical and Solid-State Physics, Mass. Inst. of Tech., Cambridge.
ANNUAL RESEARCH REPORT, by J. C. Slater. Rept. on Contract Nonr-1841(34) and others. 15 July 59, 68p. 38 refs. AD-226 422.

DESCRIPTORS: Scientific research, Solids, Crystal structure, Physical properties, Metalorganic compounds, Chemical properties, *Solid state physics, Molecular structure, *X-ray diffraction analysis, *Neutron diffraction analysis, Temperature, *Nuclear magnetic resonance, *Molecular spectroscopy, *Chemical bonds, *Transition elements, Metallurgy.

Contents:
Solid-state and molecular theory
Structure of solids by X-ray and neutron diffraction
Low-temperature and thermal properties of matter
Nuclear magnetic resonance
Molecular spectroscopy
Interatomic and intermolecular forces
Chemical and physical studies of transition metal compounds
Physical chemistry of macromolecules
Physical metallurgy
Mechanical properties of solids

PB 171 904 $2.50

Lockheed Aircraft Corp., Sunnyvale, Calif.
ELECTRON MICROSCOPY OF METALLIC SURFACES: A SURVEY OF INSTRUMENTATION AND TECHNIQUES, by Kenneth D. Carroll. Literature review, June 60, 110p. 483 refs. LMSD-895033; AD-251 039.

DESCRIPTORS: *Electron diffraction analysis, *Electron microscopy, Metals, Bibliography, Surfaces, Scientific research, Metal films, Space environmental conditions, Coatings, Surface properties.

The following discussion of electron microscopy is a review of published literature on: current instrumentation; techniques employed in observing specimens; preparation of specimens; electron diffraction; current research program funded by government contracts. This report is concerned principally with untreated metallic surfaces; the instrumentation and methods applicable to the observation of such surface phenomena Since interest was focused on this segment of electron microscopy, the extensive literature dealing with the structural analysis of metals, alloys, and crystals, as well as the other broad areas of the application of electron microscopy, have been omitted wherever possible. (Author)

AD-255 465 repriced $0.50

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
A STUDY OF THE EFFECT OF GAMMA IRRADIATION ON THIN METALLIC FILMS, by A. Boornard (RCA Labs., Camden), J. Steinberg (RCA Labs., Moorestonw), and D. B. Rosenblatt. Oct 60, 13p. 11 refs. Technical memo. M61-9-1.

DESCRIPTORS: *Thin films, *Metal films, Films, Copper, Gold, Glass, Gamma rays, Steel, *Radiation damage, Resistance, Solid state physics, Electrical properties, Crystal structure, X-ray diffraction analysis.

A study was made to investigate radiation effects in thin metallic films prepared by the vacuum evaporation process. Copper and gold films were deposited in vacuum by the thermal evaporation process on soft glass and stainless steel substrates and irradiated at Brookhaven National Laboratory at room temperature by Cobalt 60 gamma rays. The electrical resistivity was measured and X-ray diffraction patterns were obtained before and after irradiation of the samples on the glass substrates. Broadening of the X-ray diffraction patterns occurred upon irradiation of the samples on glass, but not on metal substrates. Resistivity changes were observed, but were not correlated with this line broadening. (Author)

PB 154 206 $3.60

Union Thermoelectric Corp., Forest Park, Ill.
MEETING OF QUARTZ CRYSTAL INTEGRATION COMMITTEE. [Rept. on Contract DA 36-039-sc-71061] 17 Dec 58, 40p; AD-208 711.

DESCRIPTORS: *Quartz crystals, Processing, *Quartz resonators, Design, Electrostatic capacitance, Crystals, Quartz

## Thermodynamics

PB 171 920 $2.75

Georgia Inst. of Tech., Atlanta.
THE EFFECTS OF RESONANT ACOUSTIC VIBRATIONS ON THE LOCAL AND OVERALL HEAT TRANSFER COEFFICIENTS FOR AIR FLOWING THROUGH AN ISOTHERMAL HORIZONTAL TUBE, by Thomas W. Jackson, Kenneth R. Purdy and others. Rept. on Contract AF 33(616)5742. Oct 60, 135p. 31 refs. ARL Technical rept. 60-322; AD-249 451.

DESCRIPTORS: *Acoustics, Resonance, Vibration, *Heat transfer, Tables, Experimental data, Air.

Results are presented for a series of experiments conducted for the purpose of studying the local and overall effects of a resonant acoustic vibration on the heat transfer coefficient for air flowing through a constant temperature isothermal tube at Graetz Numbers from 33 to 5400. The local heat transfer coefficient is shown to vary periodically between the nodes and loops of the resonant sound wave. Local heat transfer coefficients up to 3.6 times the no-sound values were obtained. Extensive tables of data are included for possible use in analytical investigations. Sound pressure levels to 162 decibels are reported. (Author)

CF-61-4-61 $1.60

Oak Ridge National Lab., Tenn.
AN EVALUATION OF THE PRESENT STATUS OF SWIRL-FLOW HEAT TRANSFER, by W. R. Gambill and R. D. Bundy. 24 Apr 61, 19p.

PB 155 754 $4.60

Research and Advanced Development Div., Avco Corp., Wilmington, Mass.
INVESTIGATION OF THERMAL IMAGING TECHNIQUES, by Tibor S. Laszlo and Paul J. Sheehan, Jr. Final rept. 16 Feb 60-15 Feb 61, on Contract AF 19(604)7204. 18 Apr 61, 43p. 10 refs. Technical rept. RAD-TR-61-9; AFCRL-131; AD-254 484.

DESCRIPTORS: *Solar furnaces, Materials, Temperature, Measurement, Effectiveness, Physical properties, *Calorimeters, *High temperature research, Radiometers, Parabolic bodies, Reflectors, Fluxmeters, Focusing, Controlled atmospheres, Ceramic materials Magnesium compounds, Oxides, Blackbody radiation, Thermal radiation, Solar energy, Refractory materials.

Experiments and measurements which can be successfully performed in image furnaces are listed together with the necessary special instrumentation. The restrictions imposed by basic principles of image furnaces upon their operation are discussed and methods to overcome these restrictions are proposed. Sample holders were designed to heat the entire circumference of a specimen in vacuum or controlled atmosphere. The importance of artificial blackbody cavities in the measurement of radiant flux is discussed and a new shape for such cavities is proposed. A calorimeter with the proposed shape cavity was constructed and applied to flux measurements in a 60-inch solar furnace. The results of the measurements indicated good correlation between normal incidence solar radiation and concentrated good correlation between normal incidence solar radiation and concentrated flux at the focal area. The flux was also measured with a water-cooled, fast response, fine resolution radiometer. MgO was used as the coating on the sensing disc of the radiometer and preliminary tests indicated good reproducibility and constant sensitivity of the instrument. (Author)

PB 153 300 $3.60

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
THE RATE OF VAPORIZATION OF LOW STICKING COEFFICIENT MOLECULES FROM POROUS SOLIDS. APPLICATION TO KNUDSEN EFFUSION EXPERIMENTS, by Guido L. Vidale. Rept. on Contract AF 33(616)6841. Oct 60, 33p. 14 refs. Technical Information Series R60SD468; AD-250 360.

DESCRIPTORS: *Molecules, *Vaporization, Porous materials, Diffusion, Particles, Gases, Solids, Gas diffusion *Vapor pressure.

An analysis was made of the net rate of vaporization of low sticking coefficient molecules from high porosity solids and uniform powder beds. A general solution is given which includes exactly the diffusion and vaporization kinetics for Knudsen flow conditions. Specific solutions are also given for the pressure inside a Knudsen cell containing a powdered solid layer of finite thickness; the limiting solutions for infinitely deep beds and very shallow beds also are derived. The dependence of the pressure on the cell geometry, particle size, depth of powdered bed, and vaporization coefficient are given explicitly for each case. It is

suggested that by carrying out Knudsen effusion experiments in a single Knudsen cell, and by varying the particle size to the depth of the powdered material ratio, it is possible to determine with relative ease both the equilibrium vapor pressure and the vaporization coefficient. (Author)

## Wave Propagation

PB 156 194 $4.60

Electronics Research Lab., U. of California, Berkeley.
BACK-SCATTERING FROM DIELECTRIC CONES, by C. Y. Pon and D. J. Angelakos. Rept. on Contract Nonr-222(74). 26 July 60, 41p. 6 refs. Rept. no. 110; IER series no. 60, issue no. 300; AD-245 163.

DESCRIPTORS: *Conical bodies, Dielectrics, *Electromagnetic waves, Scattering, Measurement, Aerodynamic configurations, *Radar echo areas, *Electromagnetic wave reflections, Errors.

The boundary value problem of scattering by objects may be solved by exact electromagnetic theory, approximate methods, or experimental measurements, depending on the complexity of shape and the characteristic dimension of the body. Thus far the number of experimental investigations is relatively few compared to the number of theoretical treatments. The principal objective of this research was to measure the back-scatter cross sections of a family of right circular dielectric cones of finite dimensions. A highly accurate image plane method was used for the measurements. The results indicate that considerable difference exists between the metal cones and dielectric cones, even for dielectric constants up to 20. The back-scatter patterns show more lobes for the dielectric cones than for the metal cones. A surprisingly large reflection from the larger size dielectric cones was observed for the nose-on aspect where it was practically unobservable for the metal cones. In some cases, the reflections for the nose-on aspect exceeded the reflections for the base-on aspect. (Author)

PB 155 859 $3.60

Institute of Mathematical Sciences, New York U., N. Y.
WAVE PROPAGATION IN RANDOM MEDIA, by Joseph B. Keller. Rept. on Contract AF 19(604)5238. Nov 60, 36p. 10 refs. Research rept. EM-164; AFCRL-TN-60-1149; AD-254 972.

DESCRIPTORS: *Electromagnetic waves, Light, Propagation, Wave analysis, *Wave transmission, *Light transmission, Optical analysis.

Wave propagation and random media are defined, and the nature of the mathematical problems arising in wave propagation in random media is described. The two principal types of methods for solving these problems--honest and dishonest methods--are explained. These methods are first illustrated by considering the geometrical optics of a random medium by one method of each type. Some new results are obtained by an honest method and some errors in a previous work are pointed out. Comparison is made between the results of the two methods and the reasons why they disagree are explained. As a second illustration of an honest method, an analysis of the reduced wave equation in a random medium is presented. Some known results are obtained in a new way which is simpler than the usual one and which appears to be capable of yielding further results. (Author)

PB 155 554 $9.10

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
DIFFRACTION BY A CYLINDER WITH A VARIABLE SURFACE IMPEDANCE, by Chester J. Marcinkowski and Leopold B. Felsen. Rept. on Contract AF 19(604)4143. 27 Jan 61, 102p. 35 refs. Research rept. PIBMRI-821-60; AFCRL-88; AD-254 527.

DESCRIPTORS: *Electromagnetic waves, *Diffraction, Green's function, Impedance, Surface properties, Cylindrical bodies, Perturbation theory, Difference equations.

A solution is obtained for the 2-dimensional electromagnetic problem of diffraction of the radiation from a magnetic or electric line current source by a cylinder with a spatially varying surface impedance. The surface impedance has a sinusoidal variation of small amplitude around the periphery of the cylinder superimposed upon an arbitrary, constant value. A Green's function formulation reduces the problem to an inhomogeneous, second order difference equation with variable coefficients which is solved by a perturbation procedure in terms of the small amplitude $a$ of the impedance variation. For plane wave incidence, the asymptotic form of the solution for a large cylinder ($ka >> 1$) is investigated in detail to first order in the perturbation parameter $a$. A saddle point evaluation in the illuminated region yields a result which can be interpreted in terms of the geometrical optics appropriate to a cylindrically curved, convex reflection grating. The solution comprises the first and higher order reflected rays familiar from a plane grating, modified by appropriate geometrical divergence coefficients. For a slowly varying surface impedance, conditions are derived under which the various reflected rays in the solution to $O(a)$ may be combined into a single, specularly reflected ray with a reflection coefficient depending only on the local impedance value at the point of reflection. (Author)

PB 161 597 $1.75

National Bureau of Standards, Boulder [Colo.]
ON THE CLIMATOLOGY OF GROUND-BASED RADIO DUCTS AND ASSOCIATED FADING REGIONS, by E. J. Dutton. 16 July 61, 96p. 10 refs. Technical note no. 96.

DESCRIPTORS: *Radio waves, Refraction, Attenuation, Climatic factors, Meteorology, *Wave transmission, Propagation.

An atmospheric duct is defined as occurring when geometrical optics indicates that a radio ray passing upwards through the atmosphere is sufficiently refracted that it travels parallel to the earth's surface. Maximum observed incidence of ducts was determined to be 13%, 10%, and 5% by analysis of three to five

years of radiosonde data for a tropical, temperate, and arctic location, respectively. Annual maxima are observed in the winter for the arctic and summer for the tropics. Arctic ducts arise from ground based temperature inversions with the ground temperature less than -25°C; temperate zone ducts arise from radiation inversions and accompanying humidity lapse; while tropical ducts occur with slight temperature and humidity lapses when the surface temperature is 30°C and greater. The mean initial elevation angle of a radio ray trapped by these ducts is found to be about 3 mr, with the maximum value about 5.8 mr. The steepest gradient of N observed is -420 N units/km. Observed ducts trap radio-waves of frequency $\geq$ 1 kMc at all locations for at least 50% of the time. Fading regions arising from abnormal defocussing of radio-rays passing from an elevated antenna down through the duct to a ground-based receiver are analyzed. The horizontal extent of these regions is determined for the same arctic, tropic, and temperate conditions given above. (Author)

PB 151 377-9 $1.75

National Bureau of Standards, Boulder, Colo.
QUARTERLY RADIO NOISE DATA, DECEMBER, JANUARY, FEBRUARY 1960-1961, by W. Q. Crichlow, R. T. Disney, and M. A. Jenkins. 18 Apr 61, 70p. 11 refs. Technical note no. 18-9.

DESCRIPTORS: *Noise (Radio), Measurement, Tables.

See also PB 151 377-8

## RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

PB 156 956 $9.10

Lockheed Aircraft Corp., Sunnyvale, Calif.
SYSTEM CONSIDERATIONS FOR RANDOM-SIGNAL SONARS, by J. K. Parks and J. J. Downing. Technical rept. on Communications. Dec 60, 101p. 27 refs. LMSD-895060; AD-253 300.

DESCRIPTORS: *Antisubmarine warfare, Noise, *Echo ranging, *Underwater sound transmission, *Sonar, Sonar signals, Broadband, Detection, Correlation techniques, Acoustics, Sound, Cavitation noise, Absorption, Refraction, Oceans, Signal to noise ratio, Doppler systems, Ocean bottom.

Problems concerning echo ranging, with wideband noiselike sonar signals, are examined theoretically. The relative advantages of using wideband random-noise signals instead of pulsed sinusoid signals for echo ranging are explored. Comparison between the two types of echo ranging is made. Under the assumptions, random-signal sonar is found to have advantages over conventional sonar with regard to secure echo ranging. A review is presented of the important underwater sound propagation effects observed in practice. Sound propagation effects are listed that must be considered in determining how correlation detection for the idealized conditions is degraded by realistic conditions. The degradation of correlation detection resulting from sound absorption, and Doppler shift, is examined theoretically and is found not to be prohibitive. An idea is presented for a simple optical correlator device which it is hoped will prove useful in experimentally examining the influence of sound propagation effects on correlation detection. The optical correlator technique is introduced to illustrate that complicated electronic processing may not be required to perform correlation detection of wideband long-duration noiselike sonar signals. (Author)

AD-255 295 $2.60

Princeton U., N. J.
SUBJECTIVE PROGRAMMING, by Robert J. Aumann. Research memo. no. 22 on Econometric Research Program [Contract Nonr-1858(16)]. 10 Feb 61, 23p. 10 refs.

DESCRIPTORS: *Programming, Numerical analysis, Linear systems, Operations research.

Under consideration are programming problems in which the objective function is given as a partial preference order rather than numerically. For example, many of the problems that are generally associated with the term military worth fall into this category. Conditions are given for such a problem to be transformable into a problem that can be handled numerically. (Author)

## Information Theory

PB 156 841 $1.60

Electronics Research Lab., U. of California, Berkeley.
ANOTHER APPROACH TO INFORMATION THEORY, by L. Breiman. Rept. on Contract Nonr-222(53). 15 Aug 60, 20p. 5 refs. IER series no. 60, issue no. 304; AD-246 565.

DESCRIPTORS: *Information theory, Communications theory, Mathematical analysis, Noise, Coding.

In order to try to understand better the foundations of information theory, simple elementary definitions and theorems are discussed. The justification for the Shannon definition of information lies in those remarkable results known as coding theorems. Efforts are devoted to exploring and playing with the ideas of noisy channel, capacity, coding, etc. (Author)

PB 156 842 $2.60

Electronics Research Lab., U. of California, Berkeley.
THE METRIC STRUCTURE OF CODES FOR THE BINARY SYMMETRIC CHANNEL, by A. J. Thomasian. Rept. on Contract Nonr-222(53). 15 Aug 60, 23p. 4 refs. IER series no. 60, issue no. 305; AD-246 566.

DESCRIPTORS: *Coding, *Information theory, Errors, Probability.

The main result is the following theorem: there exists an infinite sequence of binary digits which can be used to generate sliding parity check codes for the binary symmetric channel (BSC), and the error probability for such codes is close, in a certain sense, to minimum uniformly in all of the parameters: block length, probabil-

ity of error for a single digit, and rate not too much less than capacity. This results is obtained by studying the metric structure which can be required of codes, and then relating this to the error probability. (Author)

## SOCIAL SCIENCES

PB 171 921 $3.50

Stanford Research Inst., Menlo Park, Calif.
THE DEVELOPMENT AND IMPLEMENTATION OF ADVANCED INVENTORY CONTROL PROCEDURES, by P. H. Butterfield, S. G. Allen and others. Interim rept. on Contract Nonr-2311(00). Dec 60, 223p. 20 refs. SRI Project no. IU-2109; AD-252 261.

DESCRIPTORS: *Supplies, *Naval supplies, Control, *Scheduling, *Naval procurement, Distribution, Digital computers, Programming, Costs, Mathematical analysis, Economics.

The results of recent work on the development and implementation of advanced inventory control procedures is described. During the past year and a half, work under this project has been concerned with: (1) the development and pilot installation of advanced inventory decision rules at the Electronics Supply Office (ESO); (2) research toward advanced or second generation inventory management models; and (3) procedures for budgeting the Navy Stock Fund. All three aspects of the work are covered in this report. (Author)

PB 171 924 $1.25

Stanford Research Inst., Menlo Park, Calif.
DISCRETE REVIEW PROCUREMENT RULES [AND] ECONOMIC REVIEW INTERVAL, by R. H. Davis. Technical memo. no. 9 and no. 10 on Contract Nonr-2311(00). Feb 61, 43p. 4 refs. SRI Project no. IU-2109; AD-253 447.

DESCRIPTORS: *Supplies, *Costs, *Procurement, *Management engineering, Distribution, Economics, Mathematical analysis.

PB 171 926 $0.75

Stanford Research Inst., Menlo Park, Calif.
A DYNAMIC MODEL FOR PROCUREMENT [AND] OPTIMAL PROCUREMENT POLICY UNDER CONDITIONS OF REPETITIVE DEMAND CYCLES, by G. Hadley and T. M. Whitin. Technical memo. no. 13 and no. 14 on Contract Nonr-2311(00). Mar 61, 22p. 2 refs. SRI Project no. IU-2109; AD-254 054.

DESCRIPTORS: *Government procurement, *Costs, *Procurement, *Industrial procurement, Mathematical analysis, *Management engineering, *Logistics, Scheduling, *Supplies, *Military procurement, Functions.

PB 171 925 $2.50

Stanford Research Inst., Menlo Park, Calif.
A FAMILY OF INVENTORY MODELS [AND] A DISCRETE REVIEW INVENTORY MODEL WITH THE INVENTORY POSITION RESTORED EACH PERIOD, by G. Hadley and T. M. Whitin. Technical memo. no. 11 and no. 12 on Contract Nonr-2311(00). Feb 61, 105p. 15 refs. SRI Project no. IU-2109; AD-254 053.

DESCRIPTORS: *Industrial procurement, *Management engineering, Logistics, Distribution, Costs, Mathematical analysis, Programming, Scheduling, *Procurement.

PB 171 928 $1.50

Stanford Research Inst., Menlo Park, Calif.
THE INVENTORY RULES EVALUATOR. PART I. USE AND OPERATION, by Ben Lefkowitz and Donato A. D'Esopo. Technical memo. no. 18 on Contract Nonr-2311(00). Dec 60, 60p. SRI Project no. IU-2109; AD-251 521.

DESCRIPTORS: *Data processing systems, *Digital computers, *Programming, *Economics, Mathematical prediction, Instruction manuals, Operation.

The general characteristics and operation of a data processing system called IRE (Inventory Rules Evaluator) are described. In addition to outlining the purpose and proposed uses of the program, the report gives detailed instructions on how to use the program. Specifically, it covers the input data preparation, output interpretation, and machine operator's instructions. (Author)

PB 171 922 $0.75

Stanford Research Inst., Menlo Park, Calif.
MODIFICATIONS TO THE INTERIM MODEL PROCUREMENT RULES [AND] ITEM BALANCE FACTOR IN THE INTERIM MODEL PROCUREMENT RULES, by R. H. Davis. Technical memo. no. 1 and no. 2 on Contract Nonr-2311(00). Jan 61, 28p. 4 refs. SRI Project no. IU-2109; AD-251 522.

DESCRIPTORS: *Procurement, *Logistics, *Government procurement, *Supplies, *Costs, *Industrial procurement, *Military procurement, *Management engineering, Scheduling, Mathematical analysis, Functions.

Two modifications are discussed: (1) elimination of the assumption (known as Assumption 4) in the January 1959 report that the system will never have so many backorders of an item on hand that an order arriving from the vendor could fail to cover the file of backorders; and (2) incorporation of the effect of backorders into estimates of average inventory. While Assumption 4 had a negligible effect on most items, it had a significant effect upon items with demands in excess of $100,000 per year. For such items it led to an overestimate of shortages, which resulted in setting the corresponding order quantities too high. Setting the order quantities for a few high dollar--velocity items too high used up funds which would otherwise have been available to support more optimal reorder levels. (Author)

PB 171 923 $0.50

Stanford Research Inst., Menlo Park, Calif.
NEGOTIATED PROCUREMENT LEADTIMES, by G. Hadley and T. M. Whitin. Technical memo. no. 6 on Contract Nonr-2311(00). Mar 61, 12p. 2 refs. SRI Project no. IU-2109; AD-253 446.

DESCRIPTORS: *Naval supplies, *Procurement, Military procurement, *Costs, *Management engineering, Distribution, Naval logistics, *Naval procurement, Mathematical analysis, Supplies, Economics.

The length and variability of procurement leadtimes have an important influence on the safety stocks which must be carried for each item in the Navy Supply System. General procedures are described for determining optimal leadtime, and certain formulas related to this problem are derived for the case of Poisson demands and fixed leadtime. A particular example is given to illustrate a technique for solving a practical problem. The results of this example suggest that, unless the unit price increases very slowly as the specified leadtime is decreased, a point quickly is reached where it does not pay to decrease the leadtime further. (Author)

PB 171 927 $0.50

Stanford Research Inst., Menlo Park, Calif.
A REDISTRIBUTION MODEL WITH SET-UP CHARGE, by S. G. Allen. Technical memo. no. 17 on Contract Nonr-2311(00). Jan 61, 17p. 2 refs. SRI Project no. IU-2109; AD-254 055.

DESCRIPTORS: *Distribution, *Procurement, *Government procurement, Mathematical analysis, *Industrial procurement, *Management engineering, *Costs, *Logistics, Scheduling, *Military procurement, Supplies, Functions.

This redistribution procedure may be regarded as a temporary measure to correct serious imbalances in activity stockpiles between deliveries of system procurements. At each regular review within the procurement delivery cycle, the procedure provides criteria which enable a central inventory manager to determine whether any activity has excess or deficit stock for the period before the next scheduled delivery. It also permits him to determine amounts to be redistributed among activities to rectify the imbalance. These criteria are based on an objective of minimizing the cost of the redistribution and the shortage costs which may be incurred by activities within the period until the next allocation. (Author)

PB 157 057 $2.60

Stanford U., Calif.
GAME THEORY METHODS APPLIED TO THE OPTIMAL EXPANSION OF THE CAPACITY OF A FIRM, by Kenneth J. Arrow, Martin J. Beckmann, and Samuel Karlin. Technical rept. no. 27 on Contract N6onr-25133. 30 Nov 55, 24p. 1 ref. AD-79-015.

This report released for sale to the public 4 Aug 61.

DESCRIPTORS: *Operations research, Industry, Growth, *Games theory.

PB 171 917 $0.75

Armed Services Technical Information Agency, Arlington, Va.
ASTIA GUIDELENES FOR CATALOGING AND ABSTRACTING. Aug 59, rev. 22p. 3 refs.

DESCRIPTORS: *Documentation, Scientific reports, Indexes, Handbooks, *Abstracting, *Catalogs.

These bibliographic procedures are especially tailored for the technical report literature generated by the research and development programs of the Department of Defense. They are not only used by ASTIA for the Department of Defense reports, but with varying degrees of modification by several other report-producing scientific programs both in and out of the government. The purpose of issuing them in this convenient pamphlet form is to encourage standardization of bibliographic techniques for technical reports, thereby accomplishing a three-fold result: (1) increasing the effectiveness of the technical report to the scientific community, (2) avoiding unnecessary duplication and reducing the cost of the bibliographic effort, and (3) speeding up the dissemination process. (Author)

PB 171 916 $1.00

Armed Services Technical Information Agency, Arlington, Va.
AUTOMATION OF ASTIA - 1960. Dec 60, 36p. 2 refs. AD-247 000.

DESCRIPTORS: *Data processing systems, *Programming, *Punched card methods, *Scientific reports, *Documentation, *Digital computers, *Military research.

The experiences of ASTIA in automation during the year 1960 are presented. The narrative refers the reader to a previous publication, AD-227 000, for background and then details the accomplishments of ASTIA in mastering a card-configuration computer and presents the plans and current status of a tape-configuration facility. Bonuses beyond the original visualizations of the benefits of automation are also covered. (Author)

PB 171 915 $2.00

Armed Services Technical Information Agency, Arlington, Va.
EVOLUTION OF THE ASTIA AUTOMATED SEARCH AND RETRIEVAL SYSTEM, by William E. Hammond. Jan 61, 71p. 3 refs. AD-252 000.

DESCRIPTORS: *Documentation, Automation, Punched card methods, Literature, *Data processing systems, *Data storage systems, Programming, Digital computers, Magnetic recording systems, History, Scientific research, Scientific reports, Processing.

This report covers the evolution of the ASTIA automated search and retrieval system. Early consideration and punch card approaches are treated briefly. The current system and programs are described in detail with the exception of the creation of the Thesaurus which is covered in two other ASTIA publications -- AD-227 000 and AD-247 000. The programs discussed are for the UNIVAC Solid State 90 magnetic

tape system. Flow charts are included of the program now in use which executes ten simultaneous searches to four levels of coordination. Modification of this program to provide for either ten six-level coordinations or any combination of a 60-descriptor coordination is also discussed. (Author)

CF-61-3-1 $1.60

Oak Ridge National Lab., Tenn.
PREPROCESSING OF PROCEDURES IN THE ORACLE-ALGOL TRANSLATOR, by L. L. Bumgarner. 15 May 61, 17p.

TID-4025(1st Rev.)(Pt. 1) $5.25

Office of Technical Information Extension, Atomic Energy Commission, Oak Ridge, Tenn.
TRANSLATION TITLE LIST AND CROSS REFERENCE GUIDE, ed. by F. E. Stratton. June 61, 518p.

## MISCELLANEOUS

PB 171 321 $1.25, $10.00/year

Naval Research Lab., Washington, D. C.
REPORT OF NRL PROGRESS. Aug 61.

DESCRIPTORS: Naval research, Scientific research

Contents:
Articles:
A Selective Signal Detector for Measuring Low-Level, Radioactive, Airborne Contamination, by R. C. Waddel C. F. Dohne, and J. I. Hoover
The Determination of Crystal and Molecular Structure, by H. Hauptman and J. Karle
Scientific program:
Applications Research: Satellite coordinates and real-time position computation
Atmosphere and Astrophysics: Atmospheric radioactivity at Kodiak (1950-1960) and Wales (1953-1959), Alaska
Chemistry: Preparation and properties of some hydrocarbon-soluble cerium and iron compounds. Effect of polar-nonpolar solutes on the water wettability of solid surfaces submerged in oil. Laboratory method and apparatus for evaluating the water-separation properties of fuels and fuel-additive combinations. Shear characteristics of ice in bulk, at ice-solid interfaces, and at ice-lubricant-solid interfaces in a laboratory device
Electricity: Large current germanium tunnel diodes
Metallurgy and Ceramics: Optical technique for the measurement of plastic bending strains at elevated temperature. Radial strain-measuring device. Determination of iron (II) in the presence of iron (III) by using 4, 7-diphenyl-1, 10-phenanthroline. Effect of pH on the corrosion of steel at 316°C
Nuclear and Atomic Physics: Technique for the analysis of radiolytic gases adaptable for the determination of dissolved gases (oxygen and argon) in sea water and polluted river water
Radio: Technique for tuning two-element driven dipole antenna arrays. Device permits coaxial line to be used for both ac and rf transmission. Antenna and receiving system noise-temperature calculation. Effect of ideal limiting on signals and noise; the operation of an ideal limiter on signals imbedded in noise. Doppler spectral characteristics of aircraft radar targets at s-band. Survey report on thermionic electron sources. Gaussian response versus flat-top response of quartz crystal filters
Solid State Physics: Vibrational modes of disordered linear chains. [100] dendrites on LiF cleavage surfaces

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# U. S. DEPARTMENT OF COMMERCE FIELD OFFICES

## SERVE THE BUSINESS COMMUNITY

The Department of Commerce maintains Field Offices to enable the business community to avail itself locally of Government facilities designed to promote commerce. Working closely with various units in the Department and, when necessary, with other Government agencies, the Field Offices provide business services to manufacturers, wholesalers, retailers, trade publications, trade associations, advertising agencies, research groups, financial institutions, and exporters and importers.

Experienced personnel will gladly assist in the solution of specific problems, explain the scope and meaning of regulations administered by the Department, and provide practical assistance in the broad field of domestic and foreign commerce. Field offices act as official sales agents of the Superintendent of Documents, and maintain an extensive business reference library containing periodicals, directories, publications and reports from official as well as private sources.

Among the many services which businessmen have found of value are:

### GENERAL

- Management and business aids
- Establishing a new business

### BASIC ECONOMIC DATA

- Census data, with national and often State and regional breakdowns, on manufacturing, wholesaling, retailing, service industries, employment and unemployment, population, housing, agriculture
- Basic records of national income and product, regional trends, balance of payments, foreign aid

### MARKETING AND DISTRIBUTION

- Development and maintenance of markets
- Distribution channels, facilities and services
- Marketing and distribution statistics

### PRODUCTION

- Modernization of plant processes and other technological aids
- Development of new products
- Government-owned patents for free license
- Commodity standards

### FOREIGN TRADE AND INVESTMENT

- Tariff and exchange regulations
- Import and export quotas, licensing regulations
- Statistics on imports and exports
- Investment and trade opportunities abroad
- Economic conditions in foreign countries

## COOPERATIVE OFFICES

To make the services of the Department of Commerce more widely available, agreements have been entered into with more than 750 Chambers of Commerce, Manufacturers Associations, and similar business groups under which these organizations have become official Cooperative Offices of the Department. If specific information is not on hand in the Cooperative Office, your problem will be referred to the nearest Departmental field office.

## Department Field Offices

ALBUQUERQUE, N. MEX., U.S. Courthouse.
ATLANTA 3, GA., 604 Volunteer Bldg.
BOSTON 10, MASS., Room 230, 80 Federal St.
BUFFALO 3, N.Y., 504 Federal Bldg.
CHARLESTON 4, S.C., Area 2, Sergeant Jasper Bldg., West End Broad St.
CHEYENNE, WYO., 207 Majestic Bldg.
CHICAGO 6, ILL., Room 1302, 226 W. Jackson Blvd.
CINCINNATI 2, OHIO, 809 Fifth Third Bank Bldg.
CLEVELAND 1, OHIO, Federal Reserve Bank Bldg.
DALLAS 1, TEX., Room 3–104 Merchandise Mart.
DENVER 2, COLO., 142 New Customhouse.
DETROIT 26, MICH., 438 Federal Bldg.
GREENSBORO, N.C., 407 U.S. Post Office Bldg.
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JACKSONVILLE 1, FLA., 425 Federal Bldg.
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LOS ANGELES 15, CALIF., Room 450, 1031 S. Broadway.
MEMPHIS 3, TENN., 212 Falls Bldg.
MIAMI 32, FLA., 408 Ainsley Bldg.
MINNEAPOLIS 1, MINN., 304 Federal Bldg.
NEW ORLEANS 12, LA., 333 St. Charles Ave.
NEW YORK 1, N.Y., Empire State Bldg.
PHILADELPHIA 7, PA., Jefferson Bldg.
PHOENIX, ARIZ., 137 N. Second Ave.
PITTSBURGH 22, PA., 107 Sixth St.
PORTLAND 4, OREG., 217 Old U.S. Courthouse and P.O. Bldg.
RENO, NEV., 1479 Wells Ave.
RICHMOND 19, VA., 309 Parcel Post Bldg.
ST. LOUIS 1, MO., 910 New Federal Bldg.
SALT LAKE CITY 1, UTAH, 222 SW. Temple St.
SAN FRANCISCO 11, CALIF., Room 419 Customhouse.
SAVANNAH, GA., 235 U.S. Courthouse and P.O. Bldg.
SEATTLE 4, WASH., 809 Federal Office Bldg.

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